

# Hisense

Hisense

Hi-Flexi C SERIES TC



Inverter-Driven Multi-Split  
Central Air Conditioning  
Heat Pump System  
Hi-Flexi C Series Outdoor Units

## Technical Catalog

- Technical Data -
- Installation and Operation -
- Maintenance and Service -

Models

AVW-76UESR	AVW-76U7SR	AVW-76U9SR
AVW-96UESR	AVW-96U7SR	AVW-96U9SR
AVW-114UESR	AVW-114U7SR	AVW-114U9SR

# Hisense

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Specifications in this catalogue are subject to change without notice,in order that Hisense may bring the latest innovations to their customers.

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## IMPORTANT NOTICE

- HISENSE pursues a policy of continuing improvement in design and performance of products. The right is therefore reserved to vary specifications without notice.
- HISENSE cannot anticipate every possible circumstance that might involve a potential hazard.
- This heat pump air conditioner is designed for standard air conditioning only. Do not use this heat pump air conditioner for other purposes such as drying clothes, refrigerating foods or for any other cooling or heating process.
- The installer and system specialist shall secure safety against leakage according to local regulations or standards. The following standards may be applicable if local regulations are not available. British Standard, BS4434 or Japan Standard, KHKS0010.
- No part of this manual may be reproduced without written permission.
- Signal words (DANGER, WARNING and CAUTION) are used to identify levels of hazard seriousness. Definitions for identifying hazard levels are provided below with their respective signal words.

### **DANGER**

: Immediate hazards which WILL result in severe personal injury or death.

### **WARNING**

: Hazards or unsafe practices which COULD result in severe personal injury or death.

### **CAUTION**

: Hazards or unsafe practices which COULD result in minor personal injury or product or property damage.

### **NOTE**

: Useful information for operation and/or maintenance.

- It is assumed that this heat pump air conditioner will be operated and serviced by English speaking people. If this is not the case, the customer should add safety, caution and operating signs in the native language.
- If you have any questions, contact your distributor or dealer of HISENSE.
- This manual gives a common description and information for this heat pump air conditioner which you operate as well as for other models.
- Perform installation work according to local codes and regulations.
- This heat pump air conditioner has been designed for the following temperatures. Operate the heat pump air conditioner within this range.

Temperature		(°C)	
		Maximum	Minimum
Cooling Operation	Indoor	23 WB	15 WB
	Outdoor	43 DB	-15 DB
Heating Operation	Indoor	30 DB	15 DB
	Outdoor	17 WB	-20 WB

DB: Dry Bulb, WB: Wet Bulb

This manual should be considered as a permanent part of the air conditioning equipment and should remain with the air conditioning equipment.



## SAFETY SUMMARY

### **DANGER**

- Use refrigerant R410A in the refrigerant cycle. Do not charge oxygen, acetylene or other flammable and poisonous gases into the refrigerant cycle when performing a leakage test or an air-tight test. These types of gases are extremely dangerous and can cause an explosion. It is recommended that compressed air, nitrogen or refrigerant be used for these types of tests.
- Do not pour water into the indoor or outdoor unit. These products are equipped with electrical parts. If poured, it will cause a serious electrical shock.
- Do not touch or adjust safety devices inside the indoor or outdoor units. If these devices are touched or readjusted, it may cause a serious accident.
- Do not open the service cover or access panel for the indoor or outdoor units without turning OFF the main power supply.
- Refrigerant leakage can cause difficulty with breathing due to insufficient air. Turn OFF the main switch, extinguish any naked flames and contact your service contractor, if refrigerant leakage occurs.
- The installer and system specialist shall secure safety against refrigerant leakage according to local regulations or standards.
- Use on ELB (Electric Leakage Breaker). In the event of a fault, there is danger of an electric shock or a fire if it is not used.
- Do not install the outdoor unit where there is a high level of oil mist, flammable gases, salty air or harmful gases such as sulphur.

### **WARNING**

- Do not use any sprays such as insecticide, lacquer, hair spray or other flammable gases within approximately one (1) meter from the system.
- If circuit breaker or fuse is often activated, stop the system and contact your service contractor.
- Do not perform installation work, refrigerant piping work, drain piping and electrical wiring connection without referring to our installation manual. If the instructions are not followed, it may result in a water leakage, electric shock or a fire.
- Check that the ground wire is securely connected. If the unit is not correctly grounded, it lead electric shock. Do not connect the ground wiring to gas piping, water piping, lightning conductor or ground wiring for telephone.
- Connect a fuse of specified capacity.
- Do not put any foreign material on the unit or inside the unit.
- Make sure that the outdoor unit is not covered with snow or ice, before operation.
- Before performing any brazing work, check to ensure that there is no flammable material around.  
When using refrigerant be sure to wear leather gloves to prevent cold injuries.
- Protect the wires, electrical parts, etc. from rats or other small animals.  
If not protected, rats may gnaw at unprotected parts and which may lead to a fire.
- Fix the cables securely. External forces on the terminals could lead to a fire.

## **SAFETY SUMMARY**

### **CAUTION**

- Do not install the indoor unit, outdoor unit, remote control switch and cable within approximately 3 meters from strong electromagnetic wave radiators such as medical equipment.
- Supply electrical power to the system to energize the oil heater for 12 hours before start-up after a long shutdown.
- Do not step or put any material on the product.
- Provide a strong and correct foundation so that;
  - a. The outdoor unit is not on an incline.
  - b. Abnormal sound does not occur.
  - c. The outdoor unit will not fall down due to a strong wind or earthquake.
- The appliance is not to be used by children or person with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

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#### **NOTE:**

- It is recommended that the room be ventilated every 3 to 4 hours.
- The heating capacity of the heat pump unit is decreased according to the outdoor air temperature. Therefore, it is recommended that auxiliary heating equipment be used in the field when the unit is installed in a low temperature region.
- Operate the heat pump air conditioner within this range.
  - Regarding installation altitude below 1000m;
  - Regarding frequency of supply power within  $\pm 1\%$ Hz of rated frequency;
  - Regarding transport / storage temperature within  $-25\sim 55^{\circ}\text{C}$ .

## **CHECKING PRODUCT RECEIVED**

- **Upon receiving this product, inspect it for any shipping damage. Claims for damage, either apparent or concealed, should be filed immediately with the shipping company.**
- **Check the model number, electrical characteristics (power supply, voltage and frequency) and accessories to determine if they are correct.**

The standard utilization of the unit shall be explained in these instructions.

Therefore, the utilization of the unit other than those indicated in these instructions is not recommended.

Please contact your local agent, as the occasion arises.

Hisense' s liability shall not cover defects arising from the alteration performed by a customer without Hisense' s consent in a written form.

### **⚠ ATTENTION :**



This product shall not be mixed with general household waste at the end of its life and it shall be retired according to the appropriated local or national regulations in an environmentally correct way. Due to refrigerant, oil and other components contained in the Air Conditioner, its dismantling must be done by a professional installer accordingly to the applicable regulations.

**Contact the Hisense Customer Care for more information.**

# Technical Data



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HI-FLEXI C Series has the same indoor units introductions as HI-FLEXI M Series, please refer to M series Technical Catalog I for relevant details.

# 1. Features

## 1.1 Outdoor Units

Model		AVW-76UE(7)(9)SR	AVW-96UE(7)(9)SR	AVW-114UE(7)(9)SR
Power Supply		AC3Φ, 380~415V/50Hz 380V/60Hz 220V/60Hz		
Norminal Cooling Capacity	kW	22.4	28.0	33.5
Norminal Heating Capacity	kW	25.0	31.5	37.5

## 1.2 System Features

### DC Inverter-driven Central Air Conditioner

DC inverter-driven central air conditioner HI-FLEXI is a highly-efficient, reliable, comfortable, environment-friendly, and stable air conditioning system. Increased numbers of people are requiring "intelligent" facilities communication networks, office automation, including a comfortable environment. Particularly, comfortable space is required all the day through the year in the office building villa, living-house and so on This multi-split system air conditioner HI-FLEXI can meet these requirements. The proven combination of the scroll compressor and the inverter provides the best air conditioning for these buildings.

### HI-FLEXI C Series–Application of R410A Refrigerant

Hisense has been devoting to develop and introduce the new HI-FLEXI C Series to meet the global market needs to help protect the earth's environment by using non-ozone depleting refrigerant, R410A as Hisense's standard series.

### Various Indoor Units and Combinations

The line-up of new HI-FLEXI C Series indoor units has been extended up to 45 indoor units in 8 types to meet various building requirements.

Indoor Unit Type	Nominal Horsepower (kBtu/h)										
	07	09	14	18	24	27	30	38	48	76	96
Ceiling Ducted Type	○	○	○	○	○	○	○	○	○	○	○
Low-Height Duct Type	○	○	○	○	○						
4-Way Cassette		○	○	○	○	○	○	○	○		
2-Way Cassette		○	○	○	○	○		○	○		
Wall-Mounted Type		○	○	○	○22						
Floor		○	○								
Floor Conncealed		○	○								
Ceiling Type				○	○	○	○	○	○		

○: Available



### Free Connection Between Outdoor Unit and Indoor Unit

Utilizing an inverter control, a wide range of operation capacity control is also available. The total combination horsepower of max.130% and min.50% can be chosen by combination of the indoor units. Therefore, the new system can meet individual air conditioning requirements in most office buildings.

Outdoor Unit Model	Indoor Unit			
	Minimum Combination Capacity (kBTu/h)	Maximum Combination Capacity (kBTu/h)	Combination Quantity	Minimum Individual Operation Capacity (kBTu/h)
76	38	98	1 ( *1 ) ~10	07
96	48	124	1 ( *1 ) ~10	07
114	54	148	1 ( *1 ) ~10	07

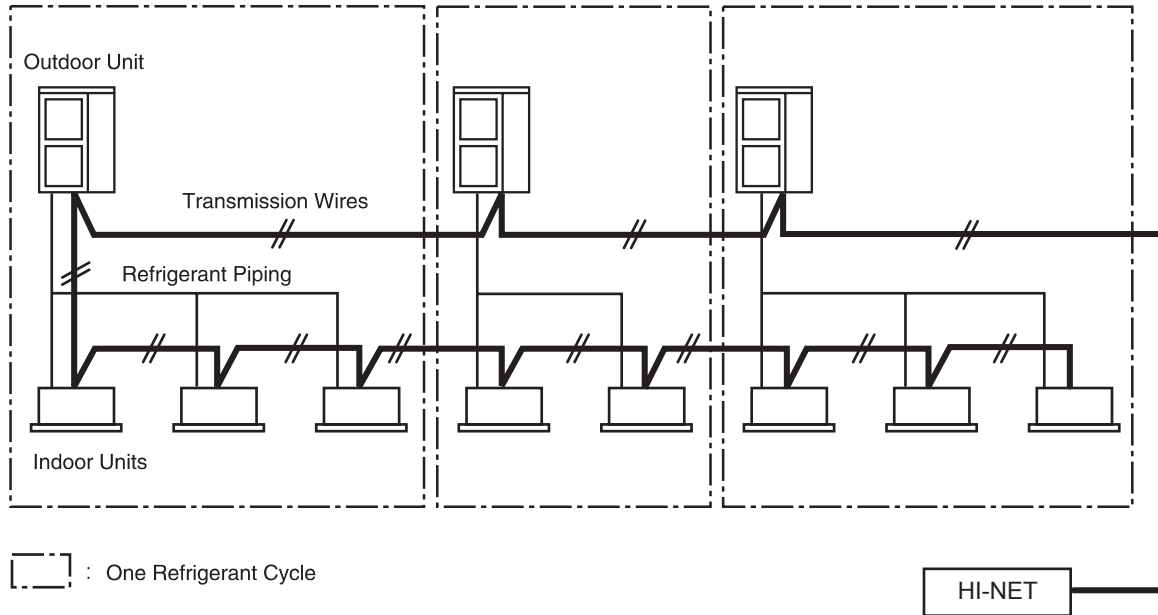
(\*1) A total capacity of 100% must be obtained by combination of the indoor units when compared with the nominal outdoor unit capacity, if only one indoor unit is combined.

## HI-NET System

The new HI-NET wiring system requires only two transmission wires connecting each indoor unit and outdoor unit for up to 64 refrigerant cycles, and connecting wires for all indoor units and all outdoor units in series.

- The total wiring length is remarkably reduced.
- Only one connection system is required for the wiring between the indoor unit and outdoor unit.
- Easy wiring connection to the central controllers.

[HI-NET Sample]



### <Specifications>

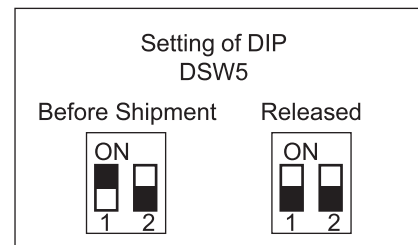
- 1) Transmission Wire: Shielded Twist Pair
- 2) Polarity of Transmission Wire: Non-Polar Wire
- 3) Maximum Outdoor Units To Be Connected: 64 Units per System
- 4) Maximum Indoor Units To Be Connected: 64 Units per Cycle and 160 Units per HI-NET System
- 5) Maximum Wiring Length: Total 1,000m (including HI-NET)
- 6) Recommended Cable: Twist-Pair Cable with Shield, over 0.75mm<sup>2</sup> (Equivalent to KPEV-S)
- 7) Voltage: DC5V

### Notes:

1. In case of applying HI-NET system, the setting of DIP switches is required. If the DIP switches are not set or set incorrectly, the alarm may occur due to the transmission failure.

### ■ DIP Switch

Before shipment, set No.1 pin of DSW10 at the "ON" side. In the case that the quantity of outdoor units in the same HI-NET are more than 1, set No.1 pin of DSW10 at the "OFF" side from the 2nd unit. If only one outdoor unit is used, no setting is required.



## New Transmission System

A non-polar shielded twist pair is applied for the transmission wires connecting indoor units and outdoor unit, so as to eliminate the damage caused by misconnection.

## Wide Operation Range

This unit has been designed for cooling operation under low ambient temperatures down to  $-5^{\circ}\text{C}$ . This feature enables cooling to be obtained even in winter on buildings with high internal heat gains due to lighting, people and machines, particularly in areas such as shops, lecture rooms, data processing areas etc. And the heating operation under low ambient temperature down to  $-20^{\circ}\text{C}$  can be also performed.

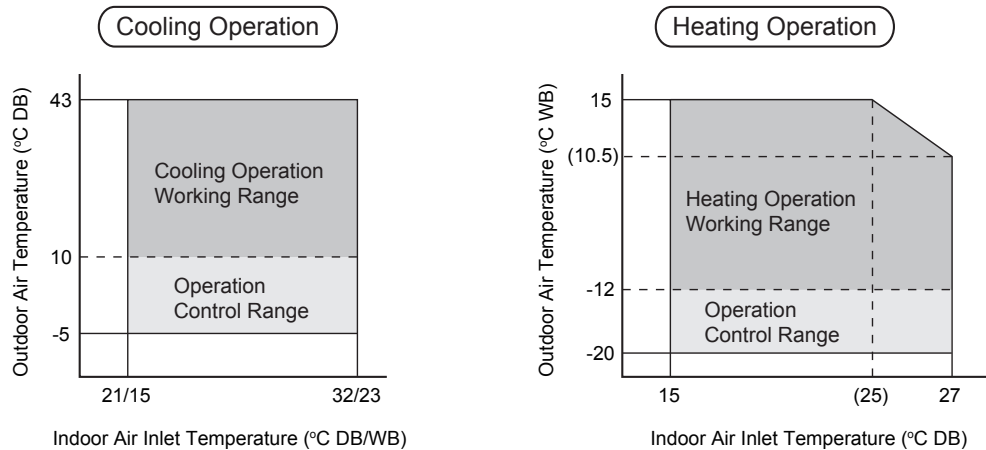
		Cooling Operation	Heating Operation
Indoor Temperature	Minimum	$21^{\circ}\text{C DB} / 15^{\circ}\text{C WB}$	$15^{\circ}\text{C DB}$
	Maximum	$32^{\circ}\text{C DB} / 23^{\circ}\text{C WB}$	$27^{\circ}\text{C DB}$
Outdoor Temperature	Minimum	$-5^{\circ}\text{C DB} (*)$	$-20^{\circ}\text{C WB} (**)$
	Maximum	$43^{\circ}\text{C DB}$	$15^{\circ}\text{C WB}$

DB: Dry Bulb, WB: Wet Bulb

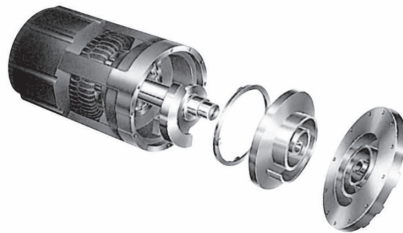
### NOTES:

(\*)  $10^{\circ}\text{C DB} \sim -5^{\circ}\text{C DB}$ , Operation Control Range

(\*\*)  $-12^{\circ}\text{C WB} \sim -20^{\circ}\text{C WB}$ , Operation Control Range



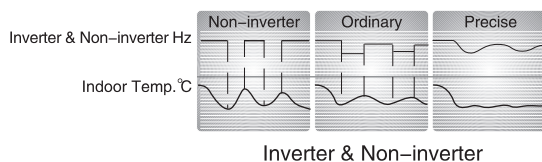
## Highly-efficient Scroll Compressor



## Inverter-driven Technology

DC inverter-driven compressor motor's working frequency can adjust according to the system's capacity thus has a more precision that realized the combination of continuous variable frequency inverter and self-adjustment controlling technology. It can meet higher requirements.

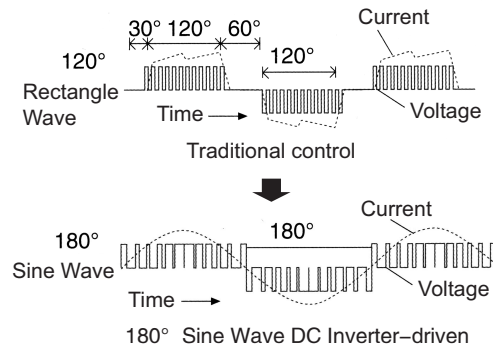
- DC inverter-driven compressor motor's working frequency can adjust automatically based on system capacity



Comparison of Conventional Inverter-driven and Hitachi Precise Inverter-driven

## The Latest 180 Degrees Sine Wave DC Inverter-driven Technology

By adopting the latest control technique, permanent magnetic synchronous motor non-sensor 3-phase vector can guarantee the smooth sine wave be output by DIP-IPM DC inverter. So, the motor can work stably and has a higher efficiency. At the same time, harmonic current and electromagnetism noise can be restrained.



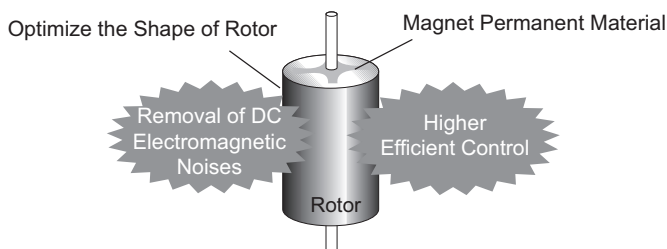
### Greatly Increased COP Value

The highly-efficient and high-pressure compressor makes the working efficiency increased.

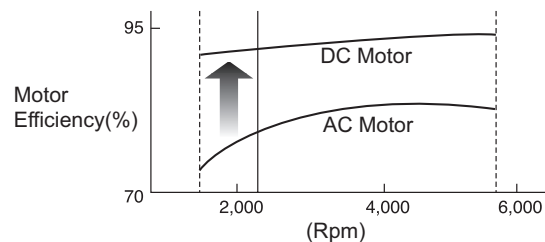
- Increasing the reliability by optimizing the bearing
- Decreasing the inhaling and leaking loss by using the asymmetry scroll plate
- Decreasing the heating loss by using the new oil circulation system
- Controlling the oil cycle precisely by ameliorating the oil system

### DC Inverter-driven Compressor

The capacity of compressor can be improved by using DC motor in the frequency ranges of 30-40Hz. At the same time, the compressor motor's rotor is separated two parts to restrain the interruption of the electromagnetism noise.

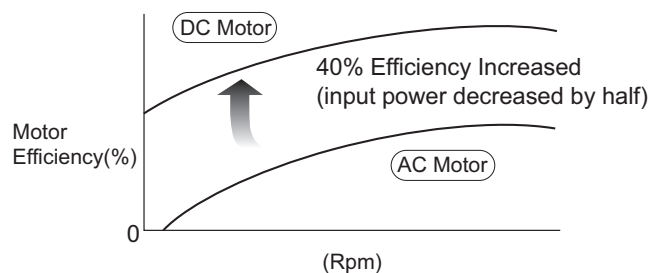


The sound of DC compressor is deleted;  
the most effective speed control



### DC Fan Motor

DC motor has a higher efficiency compared with the traditional AC motor.

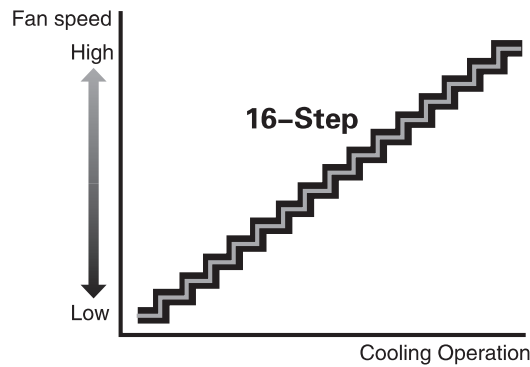


## 16-Step Fan Speed Control of Outdoor Unit

Outdoor fan of HI-FLEXI C series can achieve 16 step fan-speed control based on surroundings.

The wide frequency regulation has following priorities compared with traditional fan:

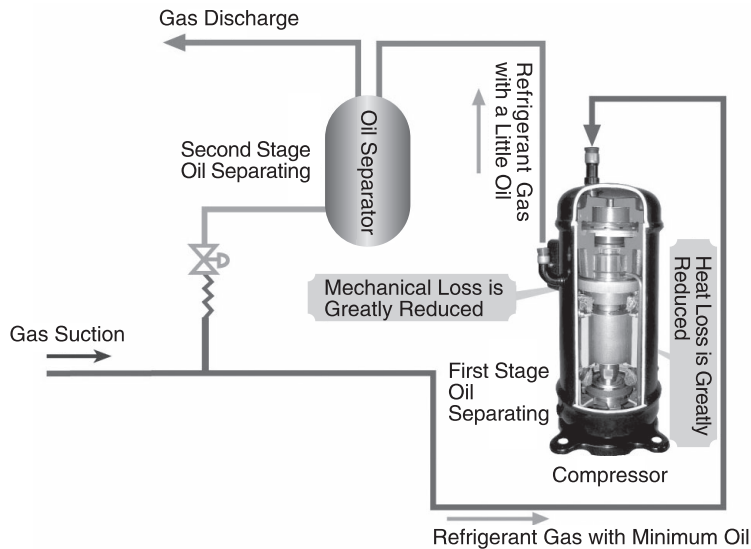
- ◆ Ensure the stability of air inlet and outlet pressure of compressor and improve its service life;
- ◆ Ensure the stability of flow rate (capacity) of indoor unit, decrease the temperature re fluctuation inside;
- ◆ Enhance the fast reaction of control system;
- ◆ Ensure stable, durable and reliable running.



16-Step Fan Speed Control of Outdoor Unit in Cooling Operation

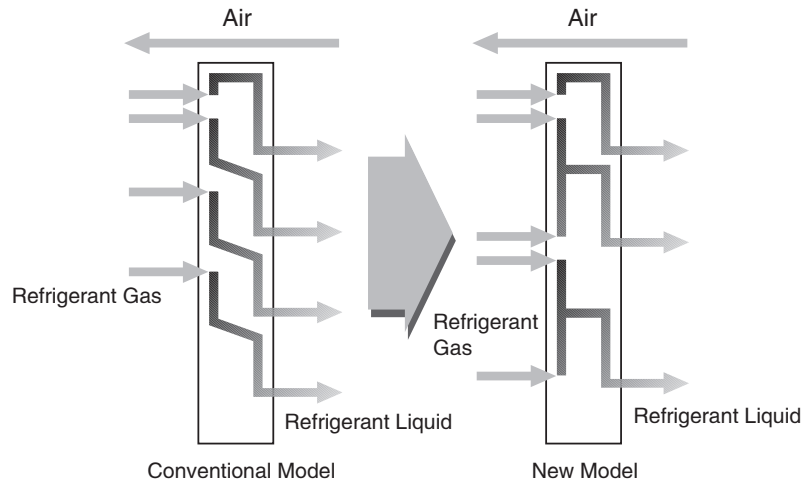
## 2-Stage Oil Separating Technology

HI-FLEXI C series apply expert high-efficient oil separating compressor to make the first oil separation. At the same time, an oil separator on gas discharge pipe line ensures the second separating, to ensure a more reliable and stable running.



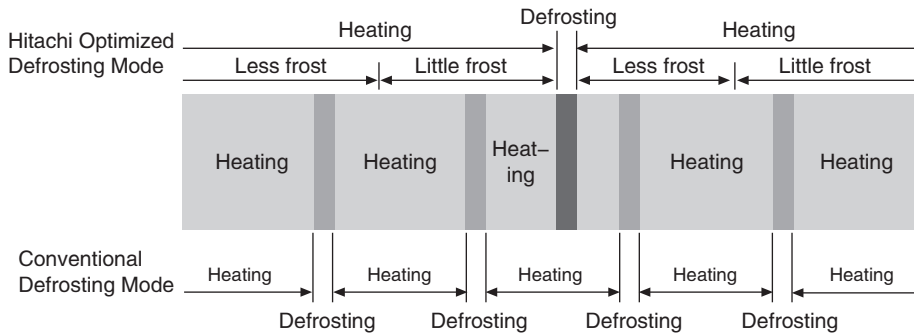
## New Type Heat Exchanger

A specially designed “2-1” refrigerant circuit optimizes the efficiency of the heat exchanger. The two-stages super-cooling circulation technique improves the unit's performance and the efficiency of heat exchanger as well.



## Intelligent Defrosting Technique Enables More Effective Heating

There is no frequency frosting and less defrosting times for system in winter, to ensure the heating effect. The outdoor unit uses the outdoor temperature sensor and heat exchanger temperature sensor, to do the variation parameter defrosting for accurately grasping the defrosting occasion. The optimum cycle control is done through the rotary speed of outdoor fan and opening of electronic expansion valve and combining with the inverter control of compressor, to delay the frosting time. The amount of frost within the unit time can be obviously reduced and only 1/3 of that of common defrosting mode.





## RoHS Measures

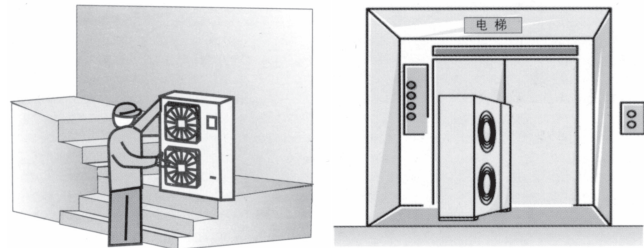
Hisense take active actions on Europe RoHS rules, and control strictly the usage of harmful substances; RoHS, referred to as "Restriction of the use of certain Hazardous Substances", aims to protect human health and ensures the reclaim and handling of scrapped electrical and electronic devices should comply with environmental requirements. The following six harmful substances are prohibited in electrical and electronic equipment: Pb, Hg, Cd, Gr+6, PBDE or PBB.



Substance	RoHS Limit	Typical Test Method
Pb	1000ppm	Wet chemical handling / X-ray fluorescence
Cd	100ppm	Wet chemical handling / X-ray fluorescence
Gr+6	1000ppm	Wet chemical handling / X-ray fluorescence
Hg	1000ppm	Wet chemical handling / X-ray fluorescence
PBB/PBDE	1000ppm	GCMS, FTTR or X-ray fluorescence

## Transported in Elevator and Stairs

HI-FLEXI C series : compact structure, space saving, easy to be moved and installed, can be transported via elevator and stairs.



Transport through Elevator and Stairs

## Installing Separately Saves Pipes and Lowers Losses

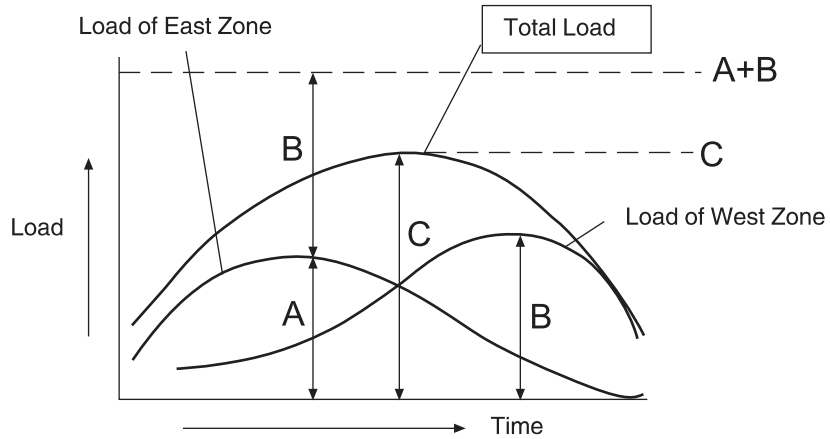
Installing separately in different floors resolves not only space problems with expansion and reconstruction, but also shortens the design length of the pipe lines, improving the running stability of the system, decreasing loss of the system and increasing the efficiency of energy.



## Decrease Total Capacity of Outdoor Units

In the same air conditioning system, HI-FLEXI compared with general single-split unit, has less capacity outdoor unit by 30%. As shown the below Fig. in a typical building, the load of east zone in the morning is 54 whereas the load of west zone in the afternoon is 66, so a traditional 114 capacity air conditioner should be equipped, but in fact the instant peak of the master zone occurs at noon, which equals to a 96 capacity, here the 96 HI-FLEXI C series are selected, which can meet all load requirements with the capacity savings of 23%.

Air Conditioning of Building



■ Common single-split type: capacity depends on the sum of all peak loads (=A+B);



■ HI-FLEXI: capacity depends on the max.sum of instant loads

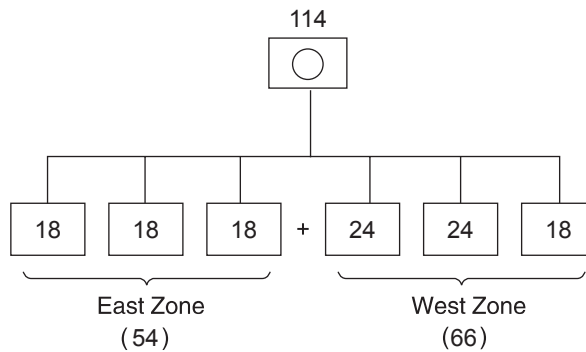
$$(A+B):C=1:0.80\sim 0.85$$

The system is composed of many indoor units and sometimes only partially operate at one time.

HI-FLEXI

Supply refrigerant according to the load of each room

$$\text{Load conversion rate} = \frac{10}{13} = 0.77$$

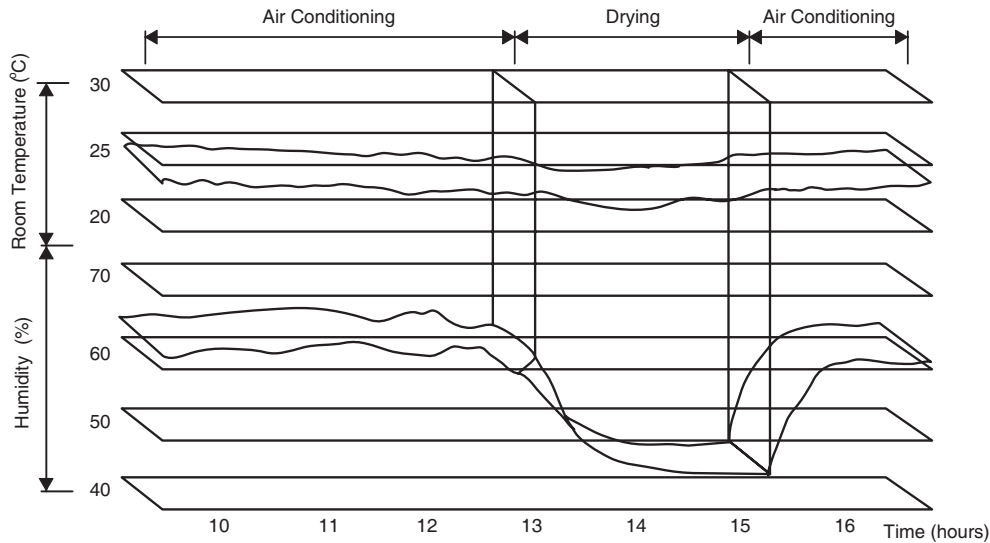


Indoor units capacity  
(equals to kBtu/h)

## Drying Operation Control

This system combining the inverter control with indoor air volume control performs efficient dehumidification with negligible change in room temperature.

Room Temperature and Humidity Variation During Dry Operation



## Trial Operation and Self-diagnosing by Multi-function Remote Control Switch and Printed Circuit Board in Outdoor Unit

A high quality control by the new remote control switch has been developed. The self-diagnosing function, which enables quick checking of operation conditions in the indoor units and outdoor unit, has been newly equipped. Furthermore, alarm data can be put into the memory of a micro-computer when an abnormality occurs.

A self-diagnosing function for printed circuit boards is also available. Various operation data such as high pressure, low pressure, etc. are indicated on the 7-segments on the printed circuit board in the outdoor unit.

By these functions, saving of maintenance period and labour during the trial operation and servicing has been achieved.

### ■ Diagnosing using the Remote Control Switch

Printed circuit boards (PCBs) can be checked using the optional LCD (Liquid Crystal Display) remote control switch. Therefore, diagnosing for PCBs at the site is quickly and accurately performed.

### ■ Data Memory in the Remote Control Switch

In the case that an abnormality occurs, the LCD remote control switch will indicate an alarm code so that quick diagnosing is available at the site.

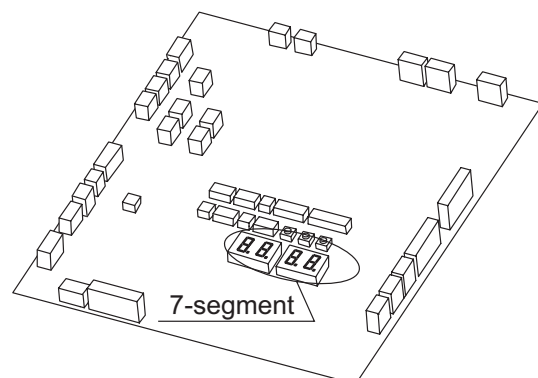
## Self-diagnosing Function

### ■ Diagnosing using the 7-Segment Display in Outdoor Unit

The PCB in the outdoor unit is equipped with three 7-segment displays. This display indicates various operating modes such as;

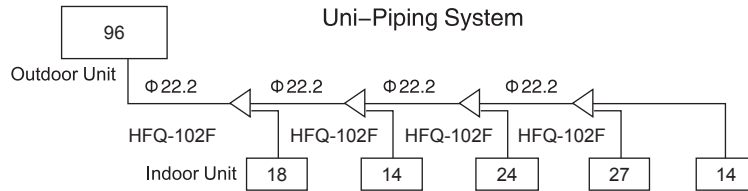
- Outdoor Air Temperature
- Discharge Gas Temperature
- Evaporating Temperature during Heating Operation
- Condensing Temperature
- Discharge Pressure
- Suction Pressure
- Compressor Run Time

Therefore, quick and accurate diagnosing is available at the site during the trial operation or normal operation.



## Increase or Decrease Indoor Units

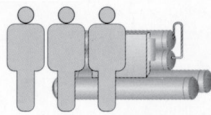
Hisense HI-FLEXI takes uni-piping system so that no refrigerant main pipe has to be changed in case that types and quantities of indoor units are change, and it won't damage inside decorations and it decreases investments on decorations for the second time.



## Stable and Reliable Operation, Lower Maintenance Costs

The unit can run stably and reliably, no special maintenance needed for an intelligent system; self-diagnosing helps effective maintenance. It can find causes of malfunctions; timely repair ensures regular business.

Special Care for Traditional Central Air Conditioner



Intelligent SET-FREE R410A System



### Alarm Code

Code No.	Category	Content of Abnormality	Leading Cause
01	Indoor Unit	Tripping of protection device	Failure of fan motor, drain discharge PCB ,relay
02	Outdoor Unit	Tripping of protection device	Activation of PSH
03	Transmission	Abnormality between indoor and outdoor(or indoor)	Incorrect wiring, failure of PCB, tripping of fuse
04	Inverter	Inverter trip of outdoor unit	Failure in transmission of PCB for inverter
05	Transmission	Abnormality of power source wiring	Reverse phase incorrect wiring
06	Voltage Drop	Voltage drop in outdoor unit excessively low or high voltage to outdoor unit	Voltage drop , incorrect wiring, tripping of fuse
...	...	...	...

Remote Control Switch

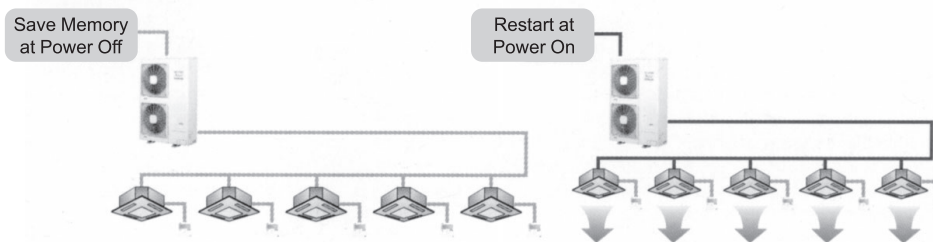


7-Segment Display



## Self-restarting

The system is able to store automatically settings and restart (or start manually by setting) after long-term power failure, to provide more intelligent and considerable services.



New fins can reduce the pressure losses, air-flow resistance decreases 20% which realizes the high efficiency and low sounds

Motor frame is of off-resonance structure that can make the work stable and reduce sounds

Reduce Vibration Sounds  
Motor works stably with less vibration and noises

Smooth Sound  
DC motor reduces sharp electromagnetic noises

Reduce electromagnetic noise  
Optimized rotor sharp  
Electromagnetic noise decreased

Super flowing propeller fan that adopts the best design of reducing sounds and increasing speed

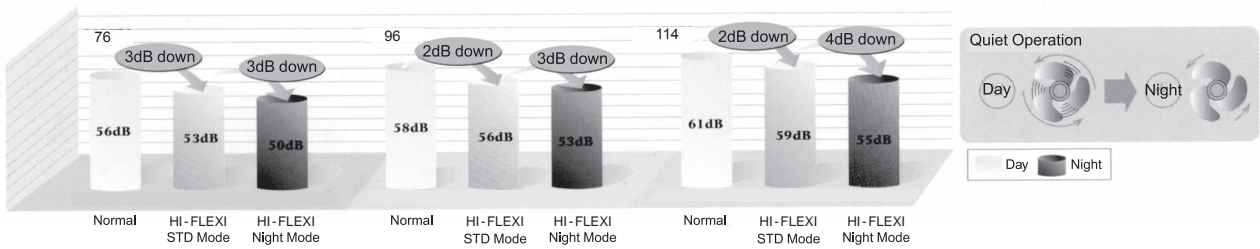
New type of bell-mouth (resin) minimizes flowing friction; helping air flow smoothly and generate lower noises

Compress Heat Exchanger Air-flow New Bell-mouth

Motor before Changing Rotor  
Motor after Changing Rotor

Noise (Hz) 10,000

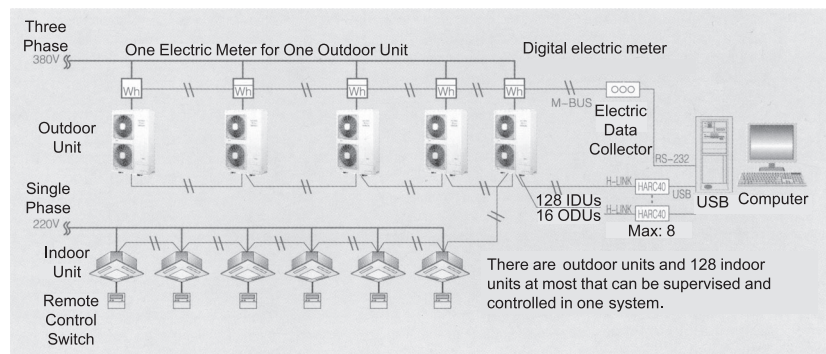
### Noises Compared with Normal Type



### Multiple Controllers



A separated measuring software based on running time, capacities and the openings of expansion valves, etc. of indoor /outdoor unit, which allocates all power consumption measured by the gauge set on the power of the units to individual unit.

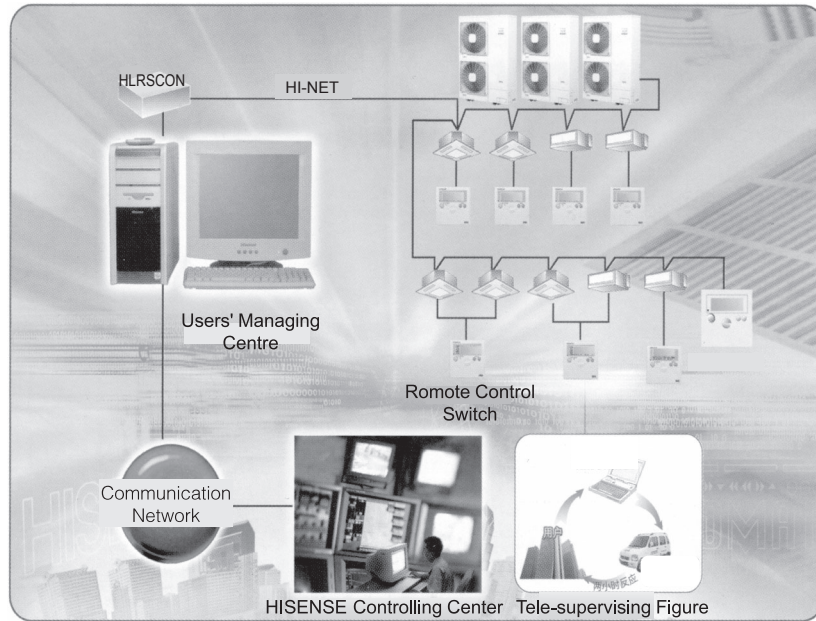




## HI -NET Air Conditioning Management System

HI-NET air conditioning management system adopts HI-NET to connect indoor units with computer which realizes a systematic control. It features on powerful function and easy operation, can supervise and control 128 sets of outdoor and 1024 sets of indoor units at the maximum.

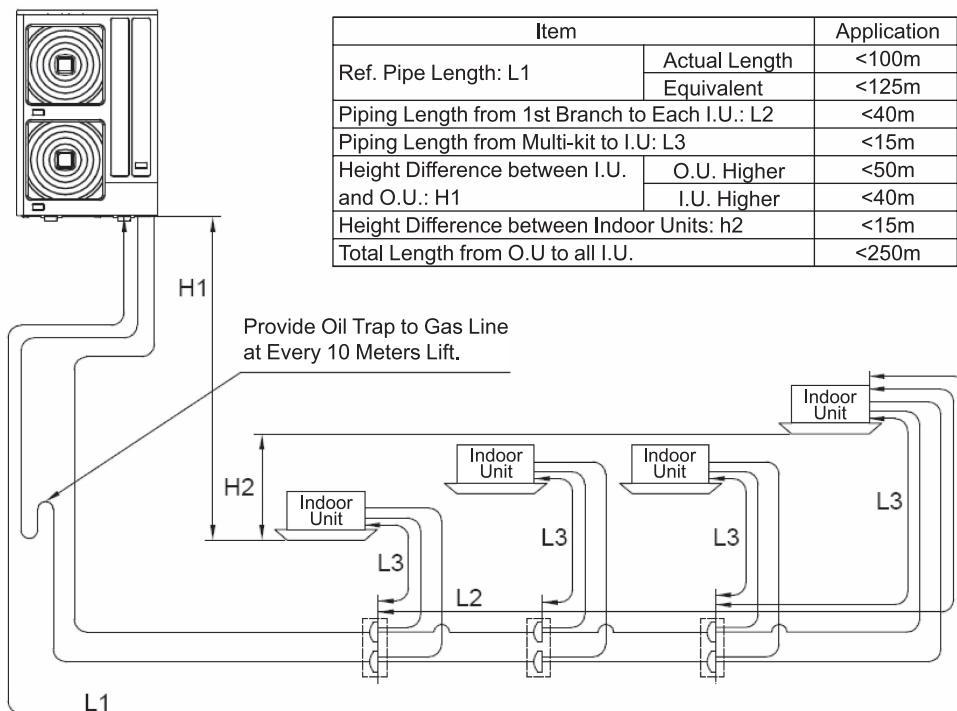
HLRSCON, the network inverter of HI-NET , is able to link as many as 128 indoor units, and realize long-distance supervising through communication network.





### 1.3 Piping System

Two kinds of piping styles available for HI-FLEXI: 1) Down-size piping system; 2) Uni-piping system  
 Piping specifications as follows:



Item		Application
Ref. Pipe Length: L1	Actual Length	<100m
	Equivalent	<125m
Piping Length from 1st Branch to Each I.U.: L2		<40m
Piping Length from Multi-kit to I.U.: L3		<15m
Height Difference between I.U. and O.U.: H1	O.U. Higher	<50m
	I.U. Higher	<40m
Height Difference between Indoor Units: h2		<15m
Total Length from O.U to all I.U.		<250m

#### I. Down-size Piping System

(Outdoor Unit ~ First Branch pipe)

Equivalent Piping Length	AVW-76UE(7)(9)SR		AVW-96UE(7)(9)SR		AVW-114UE(7)(9)SR	
	Gas/Liquid Pipe (Φmm)	Branch pipe	Gas/Liquid Pipe (Φmm)	Branch pipe	Gas/Liquid Pipe (Φmm)	Branch pipe
< 70m	19.05/9.53	HFQ-102F	22.2/12.7	HFQ-102F	25.4/12.7	HFQ-162F
≥ 70m	19.05/12.7					

(First Branch pipe ~ Last Branch pipe)

Total Capacity of I.U. ( HP )		Q<6	6≤Q<9	9≤Q<13	13≤Q<16
Pipe Diameter	Gas Pipe ( Φmm )	15.88	19.05	22.2	25.4
	Liquid Pipe ( Φmm )	9.53	9.53	9.53	12.7
Branch pipe		HFQ-102F	HFQ-102F	HFQ-102F	HFQ-162F

NOTE: In the case that the selected pipe size after the first Branch pipe is bigger than the one between the first Branch pipe and outdoor unit, use the same size as the later.

(From Last Branch pipe to Indoor Unit)

Indoor Unit Model(HP)	Pipe Sizes ( Φmm )			Remark
	Gas Pipe	Liquid Pipe		
1.0~1.5	12.7	6.35		
1.8~2.0	15.88	6.35		
2.3~6.0	15.88	9.53		
8	19.05	9.53		
10	22.2	9.53		

#### II. Uni-piping System

(Outdoor Unit to Branch pipe)

Equivalent Pipe Length	AVW-76UE(7)(9)SR		AVW-96UE(7)(9)SR		AVW-114UE(7)(9)SR	
	Gas/Liquid Pipe ( Φmm )	Branch pipe	Gas/Liquid Pipe (Φmm)	Branch pipe	Gas/Liquid Pipe (Φmm)	Branch pipe
< 70m	19.05/9.53	HFQ-102F	22.2/12.7	HFQ-102F	25.4/12.7	HFQ-162F
≥ 70m	19.05/12.7					

NOTE: The "Uni-piping" means that the pipe size of the first Branch pipe to outdoor unit and among the branches is same. And the size of the pipes between indoor unit to Branch pipe (gas and liquid) is the same of that in down-size piping system.

## 2. General Data

### Outdoor Units General Data

Model		AVW-76UE(7)(9)SR	AVW-96UE(7)(9)SR	AVW-114UE(7)(9)SR
Power Supply		AC3Φ 380V~415V/50Hz 380V/60Hz, 220V/60Hz		
Nominal Cooling Capacity*1)	kW	23.2	28.6	33.9
	Btu/h	79,200	97,600	115,700
Nominal Cooling Capacity*2)	kW	22.4	28.0	33.5
	Btu/h	76,400	95,500	114,300
Nominal Heating Capacity	kW	25.0	31.5	37.5
	Btu/h	85,300	107,500	12,800
Cabinet Color		Natural Gray (1.0Y 8.5/0.5)		
Sound Pressure Level (Overall A Scale) Cooling/Heating	dB	53/55	56/58	59/61
Outer Dimensions	H	mm	1,650	1,650
	W	mm	1,100	1,100
	D	mm	390	390
Net Weight	kg	168	168	171
Refrigerant Category		R410A		
Refrigerant Flow Control		Micro-Computer Control Expansion Valve		
Compressor Model		Hermetic (Scroll)		
		E656DHD	E656DHD	E656DHD
Compressor Quantity		1	1	1
Compressor Output (Pole)	kW	4.8(4)	6.0(4)	7.2(4)
Refrigerant oil type		FVC68D		
Refrigerant oil Charge	L/Unit	1.9	1.9	1.9
Heat Exchanger		Multi-Pass Cross-Finned Tube		
Condenser Fan		Propeller Fan		
Quantity		2	2	2
Air Flow Rate	m <sup>3</sup> /min	121	150	163
Motor Output (Pole)	kW	0.17(8)x1+0.12(6)x1	0.17(8)x1+0.12(6)x1	0.17(8)x1+0.20(6)x1
Connections		Flare-Nut Connection(With Flare Nuts)		
Refrigerant Piping Liquid Line	mm	Φ9.53	Φ12.7	Φ12.7
	(in.)	(3/8)	(1/2)	(1/2)
Gas Line	mm	Φ19.05	Φ22.2	Φ25.4
	(in.)	(3/4)	(7/8)	(1)
Refrigerant Charge	kg	5.0	5.5	6.5
Approximate Packing Measurement	m <sup>3</sup>	1.01	1.01	1.01

#### NOTES:

1.The nominal cooling and heating capacities show the capacities when the outdoor unit is operated with the 100% rating of indoor units, and are based on the standard JIS B8616.

##### Cooling Operation Conditions

Indoor Air Inlet Temperature: 27°C DB(80°F DB)  
 \*1): 19.5°C WB (67°F WB)  
 \*2): 19.0°C WB (66.2°F WB)  
 Outdoor Air Inlet Temperature: 35°C DB(95°F DB)  
 Piping Length: 7.5 Meters Piping Lift: 0 Meter

##### Heating Operation Conditions

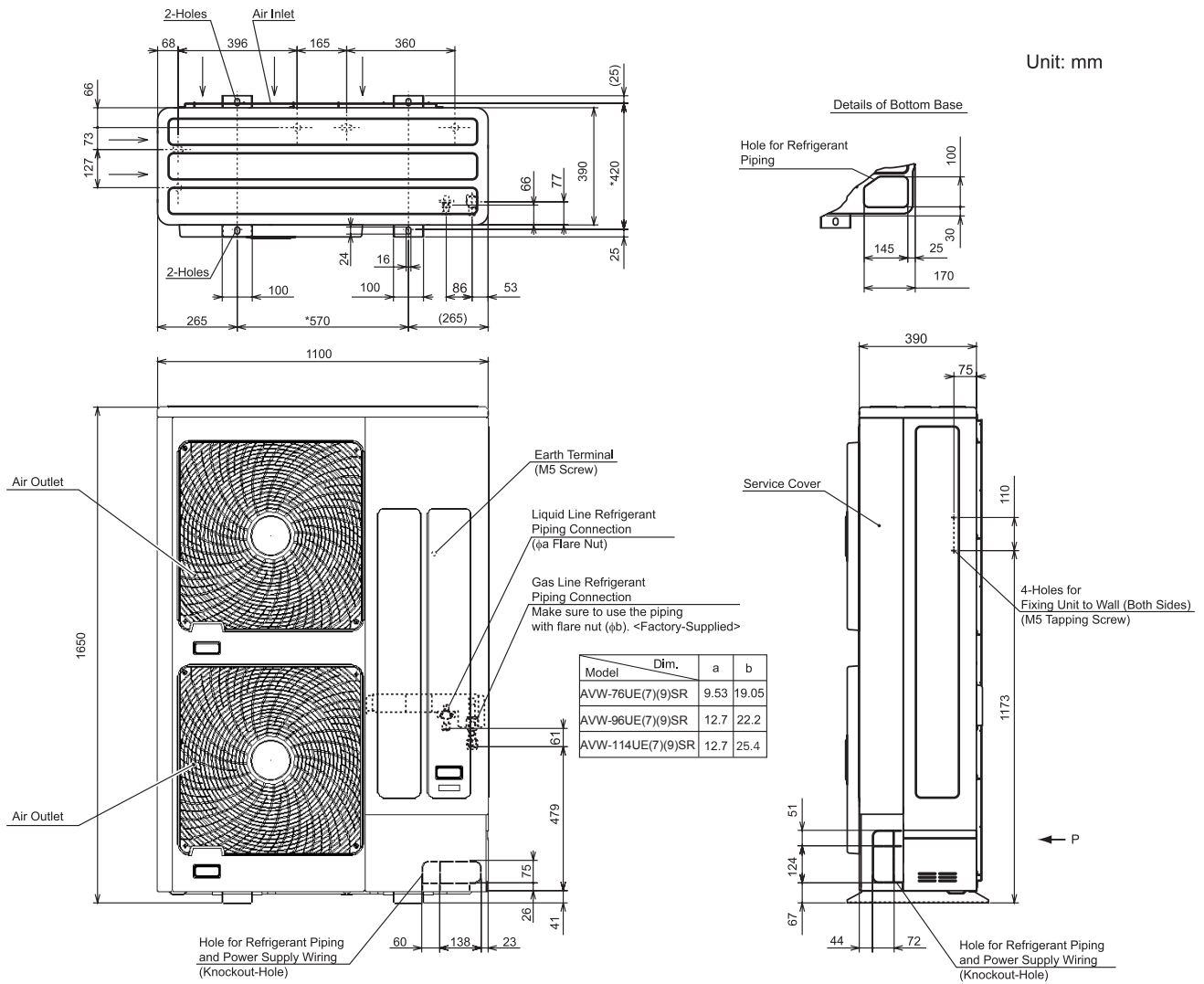
Indoor Air Inlet Temperature: 20°C DB(68°F DB)  
 Outdoor Air Inlet Temperature: 7°C DB(45°F DB)  
 6°C WB(43°F WB)

2.The sound pressure level is based on following conditions:  
 1.5 Meters from floor Level, and 1 Meter from the unit service cover surface.

The above data was measured in an anechoic chamber so that reflected sound should be taken into consideration in the field.

### 3. Dimensional Data

#### 3.1 Dimensional Data for Outdoor Units



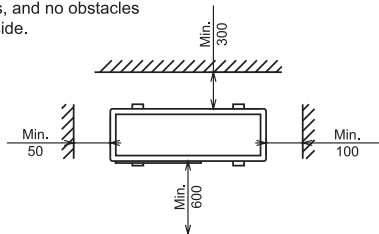
**Drain Water**

Drain water is caused during heating or defrosting operation.

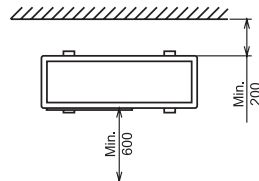
- 1) Choose a place where well drainage is available.
- 2) Do not provide an upward slope from the unit to avoid reverse flow of the drain.  
Provide a second drainpan under the outdoor unit to correct drain water securely.

**Service Space**

In case of obstacles on both sides, and no obstacles of upper side.



In case of no obstacles on both sides, and upper side.

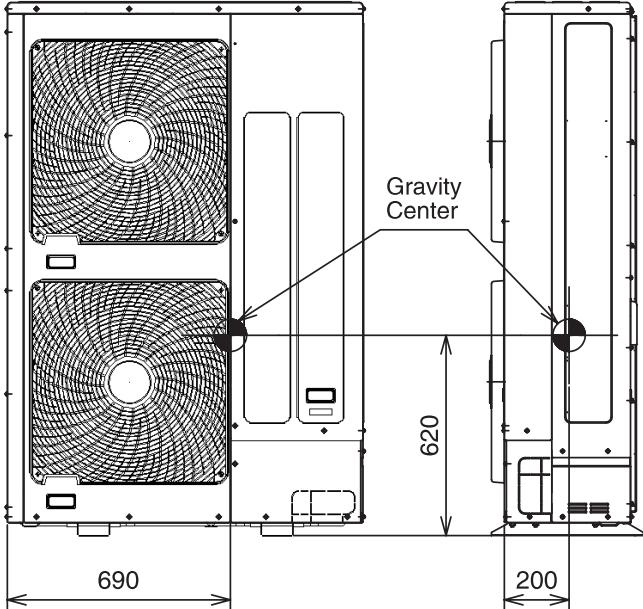


**NOTES:**

1. Although refrigerant has been charged into this unit additional refrigerant charge is required according to piping length.
2. There are stop valves in the cabinet.
3. In the case that dimension of 170 marked with is provided, it is possible to perform piping work from the bottom without interference such as foundation, etc.
4. The dimension marked with \* indicates the mounting pitch dimension for anchor bolts.
5. If the piping length is over 70 meters, the liquid pipe diameter should be φ12.7 instead of φ9.53. (AVW-76UE(7)SR Only)

### 3.2 Gravity Center of Outdoor Unit

Type: AVW-76UE(7)(9)SR、AVW-96UE(7)(9)SR、AVW-114UE(7)(9)SR



## 4. Selection Data

### 4.1 Selection Guide

#### (1) Model Description

Indoor Unit Type	Nominal Horsepower (kBtu/h)										
	07	09	14	18	24	27	30	38	48	76	96
Ceiling Ducted Type	○	○	○	○	○	○	○	○	○	○	○
Low-Height Duct Type	○	○	○	○	○						
4-Way Cassette		○	○	○	○	○	○	○	○		
2-Way Cassette		○	○	○	○	○		○	○		
Wall-Mounted Type		○	○	○	○22						
Floor		○	○								
Floor Conncealed		○	○								
Ceiling Type				○	○	○	○	○	○		

○: Available

Note:

When selecting the indoor unit and outdoor unit, the total capacity of indoor units should match with that of outdoor unit.

#### (2) Standard Capacity of Outdoor Unit:

Model		AVW-76UE(7)(9)SR	AVW-96UE(7)(9)SR	AVW-114UE(7)(9)SR
Cooling Capacity	kW	22.4	28.0	33.5
	kcal/h	19,300	24,100	28,800
	Btu/h	76,400	95,500	114,500
Heating Capacity	kW	25.0	31.5	37.5
	kcal/h	21,500	27,100	32,200
	Btu/h	85,300	107,500	128,000

**(3) Standard capacity of outdoor unit is under the condition that the total indoor unit horsepower is the same as outdoor unit horsepower. If the total indoor unit horsepower is not equal to the outdoor unit horsepower, refer to “Capacity Characteristic Curve of Outdoor Units” in item 4.4.**

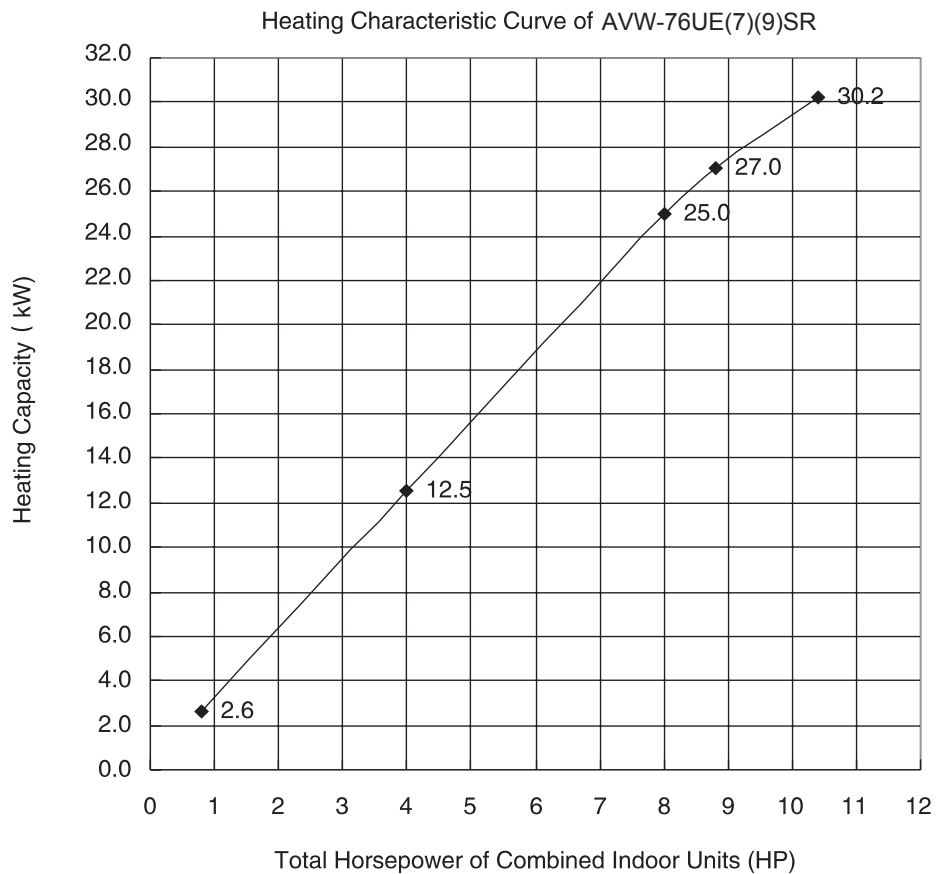
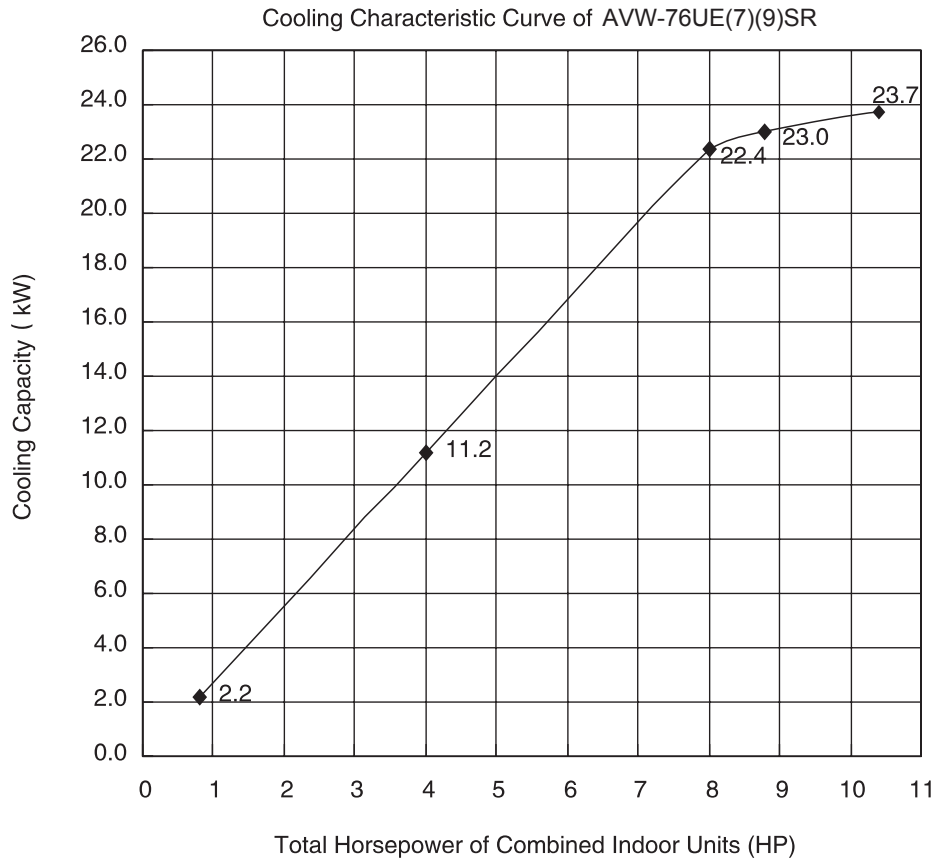
#### (4) Max. Actual Capacity of Outdoor Unit

Max. actual capacity of outdoor unit=(outdoor unit capacity at nominal temp. \* correction factor according to total indoor unit capacity \* correction factor according to piping length and lift \* correction factor according to temperature condition)

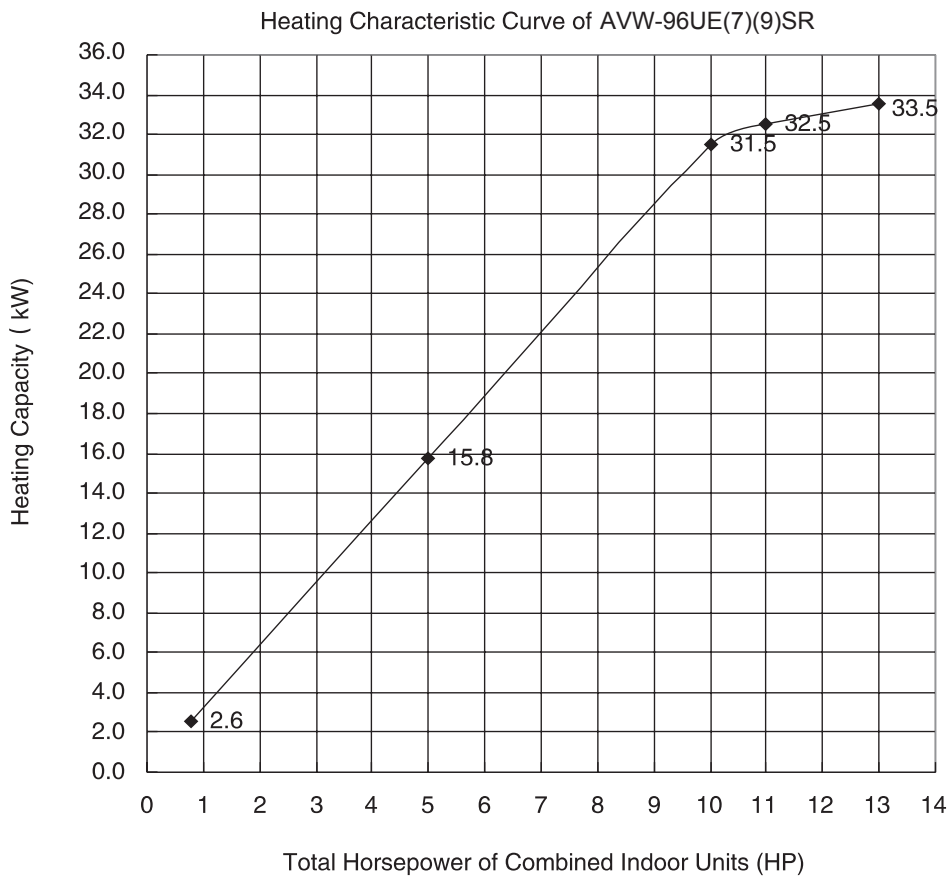
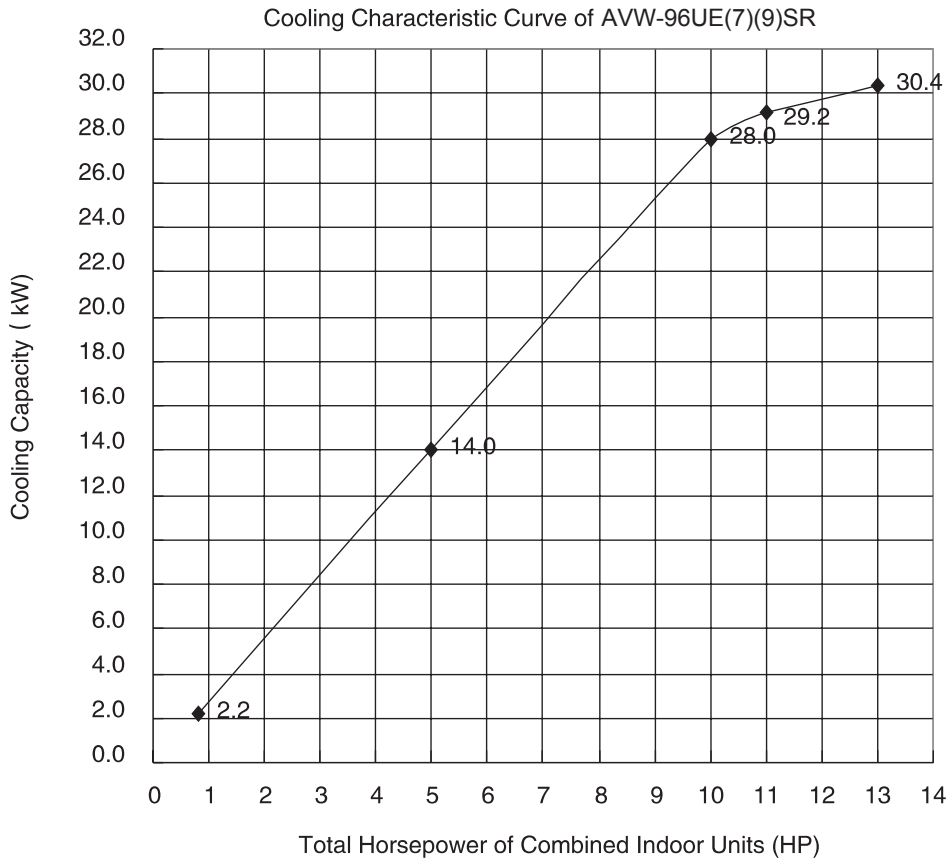
Note: in heating operation conditions, the defrosting operation should be considered.

## 4.2 Capacity Characteristic Curve of Outdoor Units

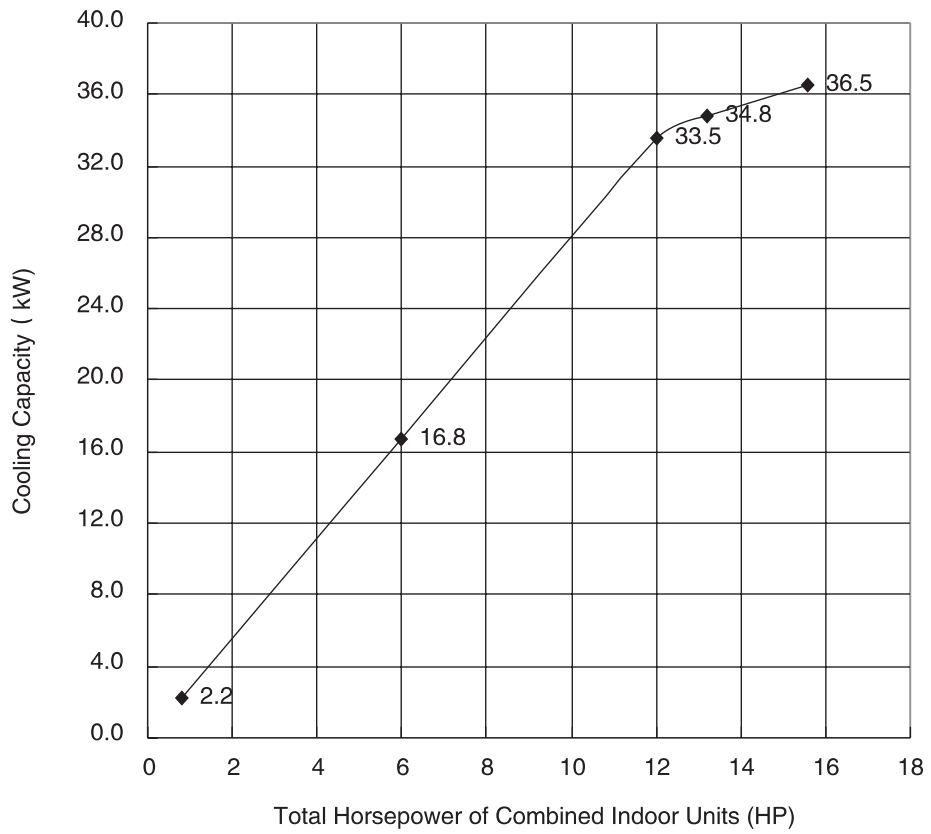
The following charts show the characteristics of outdoor unit capacity which corresponds with total horsepower of combined indoor units, with standard conditions of 7.5m long horizontally installed refrigerant piping.



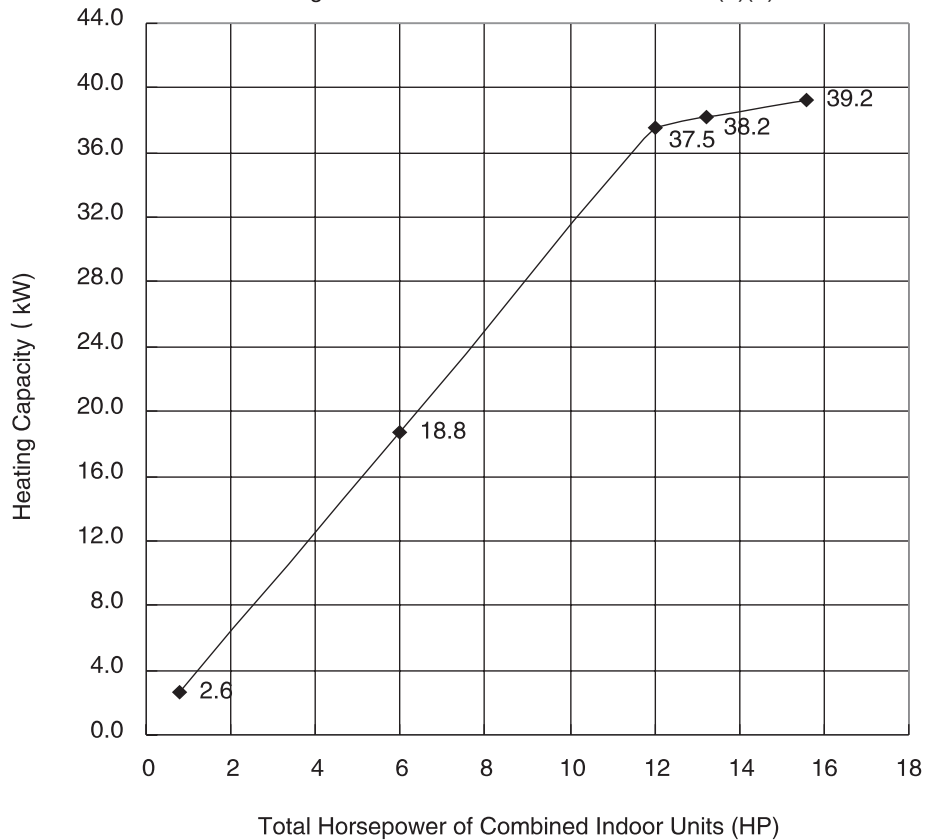




Cooling Characteristic Curve of AVW-114UE(7)(9)SR



Heating Characteristic Curve of AVW-114UE(7)(9)SR

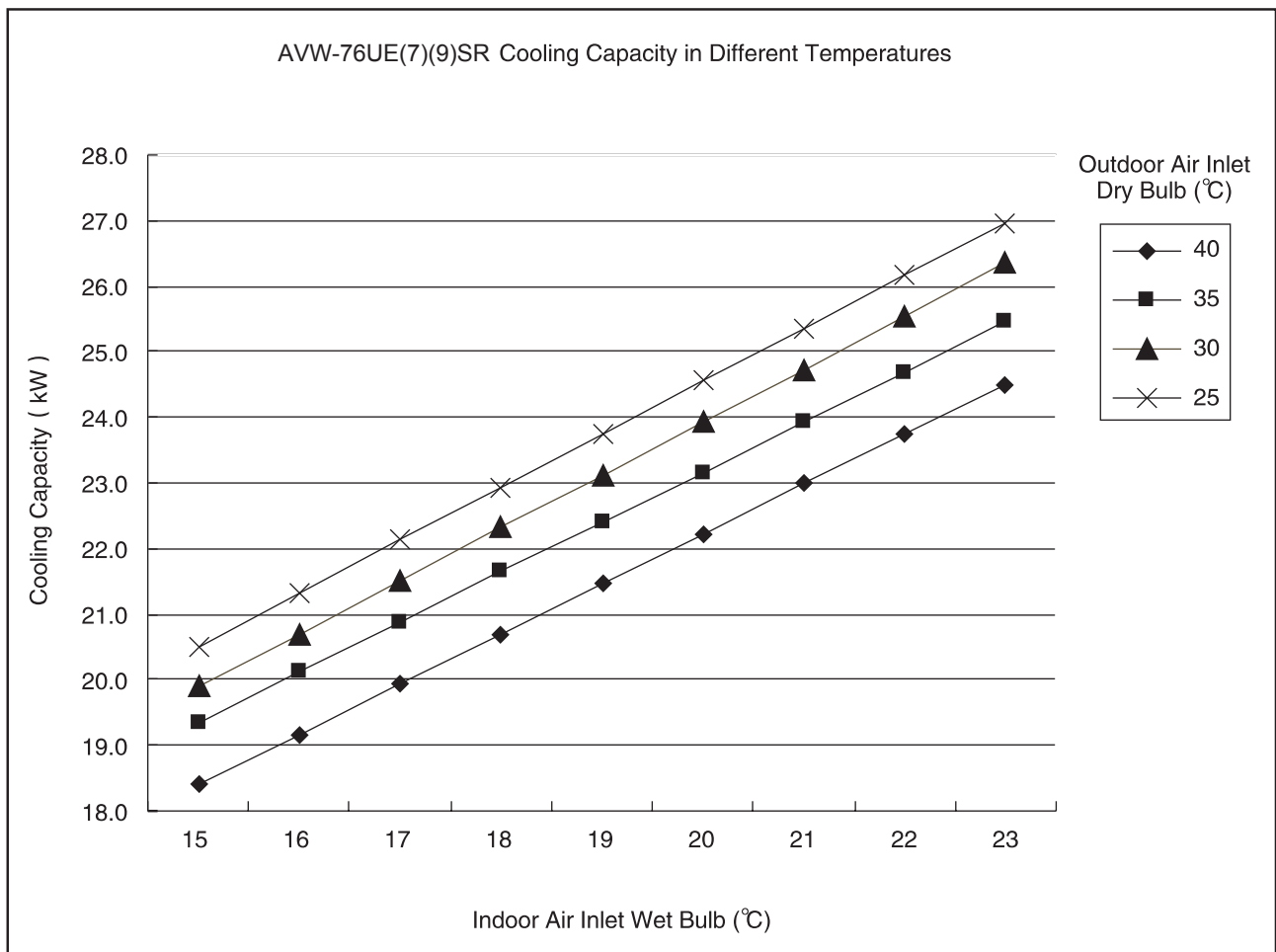


### 4.3 Temperature Correction in Cooling Operation

#### 1. AVW-76UE(7)(9)SR

		Cooling Temp. Correction Factor								
Outdoor Air Inlet Dry Bulb (°C)	Indoor Air Inlet Wet Bulb (°C)	15	16	17	18	19	20	21	22	23
	40		0.82	0.86	0.89	0.92	0.96	0.99	1.03	1.06
35		0.86	0.90	0.93	0.97	1.00	1.03	1.07	1.10	1.14
30		0.89	0.92	0.96	1.00	1.03	1.07	1.10	1.14	1.18
25		0.92	0.95	0.99	1.02	1.06	1.10	1.13	1.17	1.20

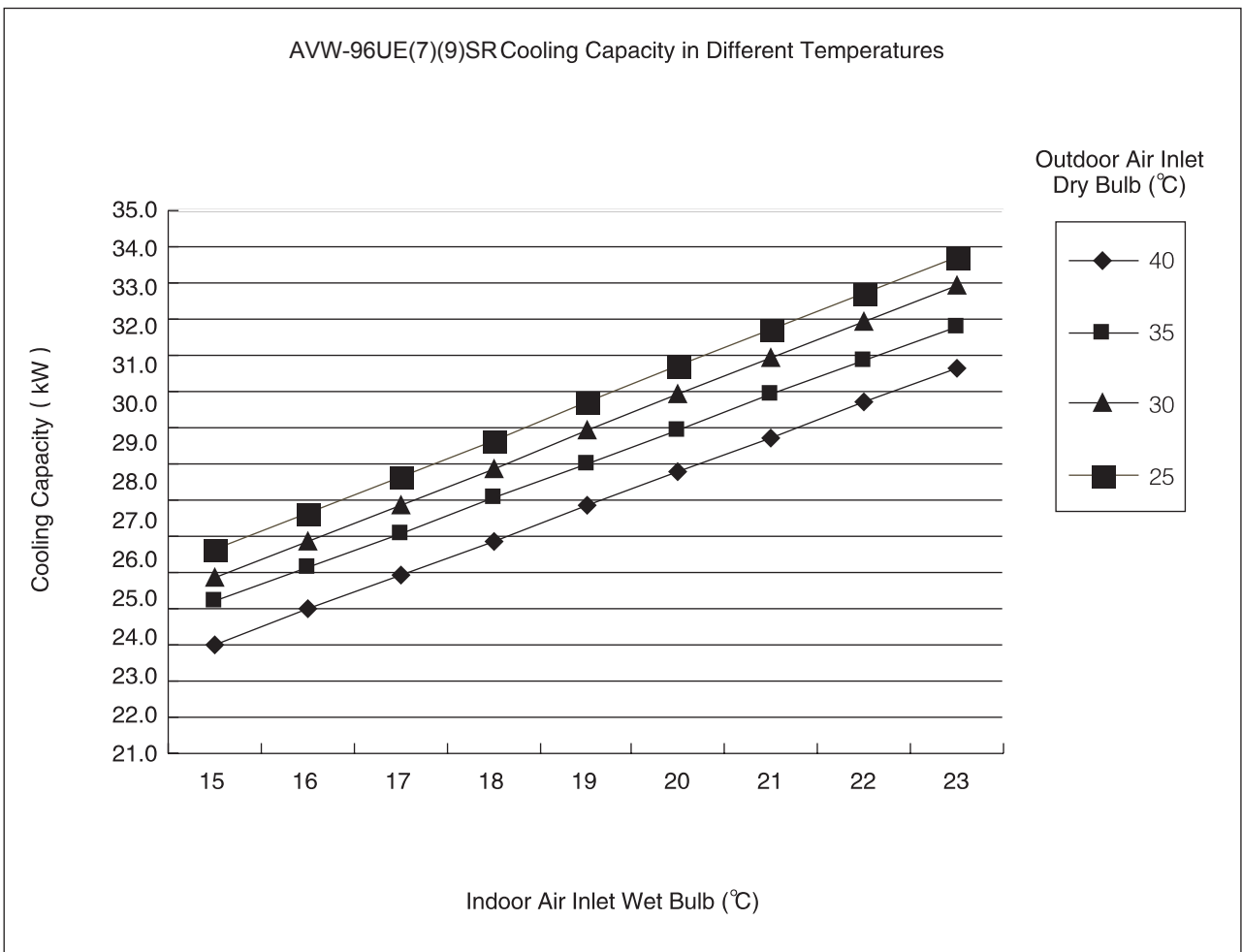
		Cooling Capacity								Unit: kW
Outdoor Air Inlet Dry Bulb (°C)	Indoor Air Inlet Wet Bulb (°C)	15	16	17	18	19	20	21	22	23
	40		18.4	19.2	19.9	20.7	21.5	22.2	23.0	23.7
35		19.4	20.1	20.9	21.6	22.4	23.2	23.9	24.7	25.4
30		19.9	20.7	21.5	22.3	23.1	23.9	24.7	25.5	26.3
25		20.5	21.3	22.1	22.9	23.7	24.6	25.4	26.2	27.0



2. AVW-96UE(7)(9)SR

		Cooling Temp. Correction Factor								
Outdoor Air Inlet Dry Bulb (°C)	Indoor Air Inlet Wet Bulb (°C)	15	16	17	18	19	20	21	22	23
	40		0.82	0.86	0.89	0.92	0.96	0.99	1.03	1.06
35		0.86	0.90	0.93	0.97	1.00	1.03	1.07	1.10	1.14
30		0.89	0.92	0.96	1.00	1.03	1.07	1.10	1.14	1.18
25		0.92	0.95	0.99	1.02	1.06	1.10	1.13	1.17	1.20

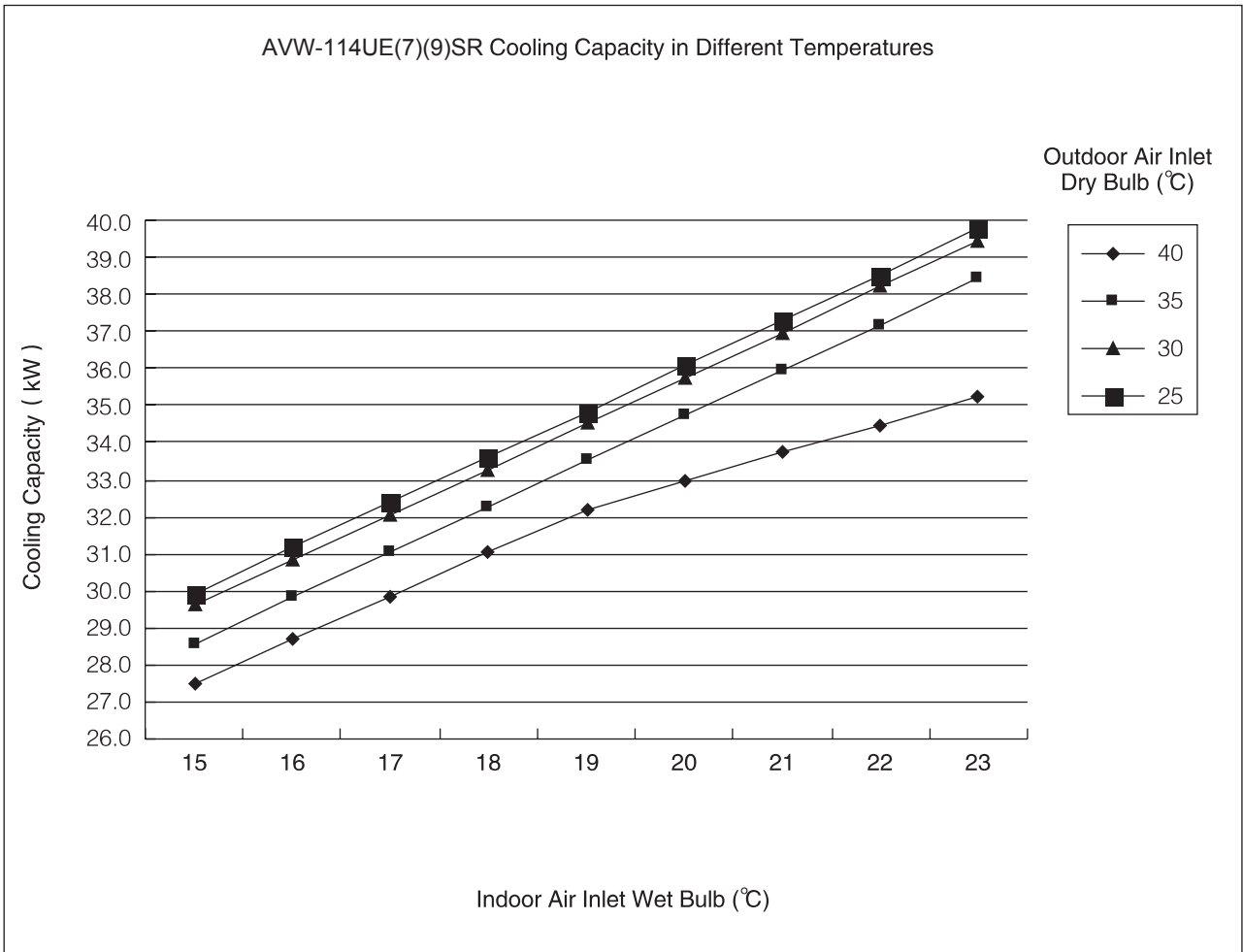
		Cooling Capacity									Unit: kW
Outdoor Air Inlet Dry Bulb (°C)	Indoor Air Inlet Wet Bulb (°C)	15	16	17	18	19	20	21	22	23	
	40		23.0	24.0	24.9	25.9	26.8	27.8	28.7	29.7	30.6
35		24.2	25.1	26.1	27.0	28.0	29.0	29.9	30.9	31.8	
30		24.9	25.9	26.9	27.9	28.9	29.9	30.9	31.9	32.9	
25		25.6	26.7	27.7	28.7	29.7	30.7	31.7	32.7	33.7	



3. AVW-114UE(7)(9)SR

		Cooling Temp. Correction Factor								
Outdoor Air Inlet Dry Bulb (°C)	Indoor Air Inlet Wet Bulb (°C)	15	16	17	18	19	20	21	22	23
	40		0.82	0.86	0.89	0.93	0.96	0.98	1.01	1.03
35		0.85	0.89	0.93	0.96	1.00	1.04	1.07	1.11	1.15
30		0.88	0.92	0.96	0.99	1.03	1.07	1.10	1.14	1.18
25		0.89	0.93	0.97	1.00	1.04	1.08	1.11	1.15	1.19

		Cooling Capacity									Unit: kW
Outdoor Air Inlet Dry Bulb (°C)	Indoor Air Inlet Wet Bulb (°C)	15	16	17	18	19	20	21	22	23	
	40		27.5	28.7	29.9	31.0	32.2	33.0	33.7	34.5	35.2
35		28.6	29.8	31.0	32.3	33.5	34.7	36.0	37.2	38.4	
30		29.6	30.8	32.0	33.3	34.5	35.7	37.0	38.2	39.4	
25		29.9	31.2	32.4	33.6	34.8	36.1	37.3	38.5	39.8	

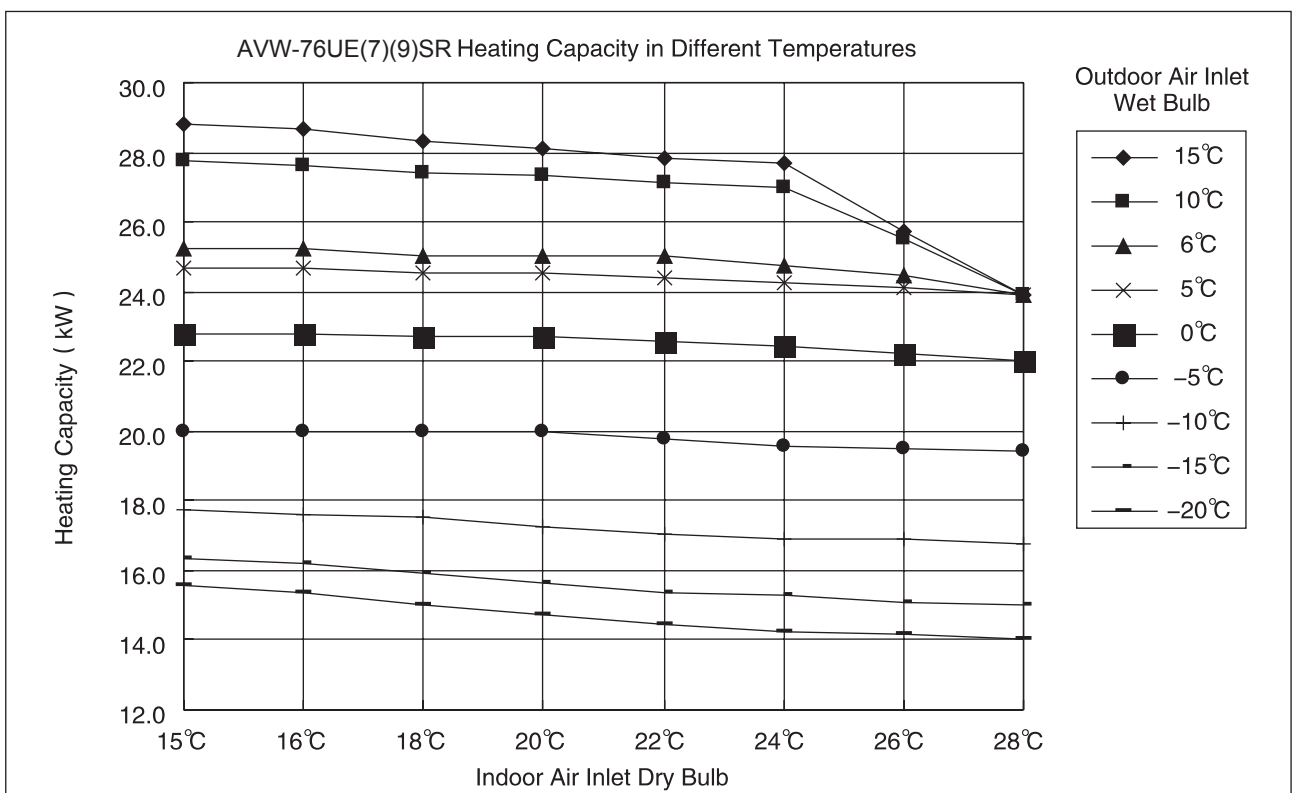


## 4.4 Temperature Correction in Heating Operation

### 1. AVW-76UE(7)(9)SR

		Heating Temp. Correction Factor							
Outdoor Air Inlet Wet Bulb (°C)	Indoor Air Inlet Dry Bulb (°C)	15°C	16°C	18°C	20°C	22°C	24°C	26°C	28°C
	15°C		1.15	1.15	1.13	1.13	1.11	1.11	1.03
10°C		1.11	1.10	1.10	1.09	1.09	1.08	1.02	0.96
6°C		1.01	1.01	1.00	1.00	1.00	0.99	0.98	0.96
5°C		0.99	0.99	0.98	0.98	0.98	0.97	0.96	0.96
0°C		0.91	0.91	0.91	0.91	0.90	0.90	0.89	0.88
-5°C		0.80	0.80	0.80	0.80	0.79	0.78	0.78	0.78
-10°C		0.71	0.71	0.70	0.69	0.68	0.68	0.68	0.67
-15°C		0.65	0.65	0.64	0.63	0.62	0.61	0.60	0.60
-20°C		0.62	0.62	0.60	0.59	0.58	0.57	0.57	0.56

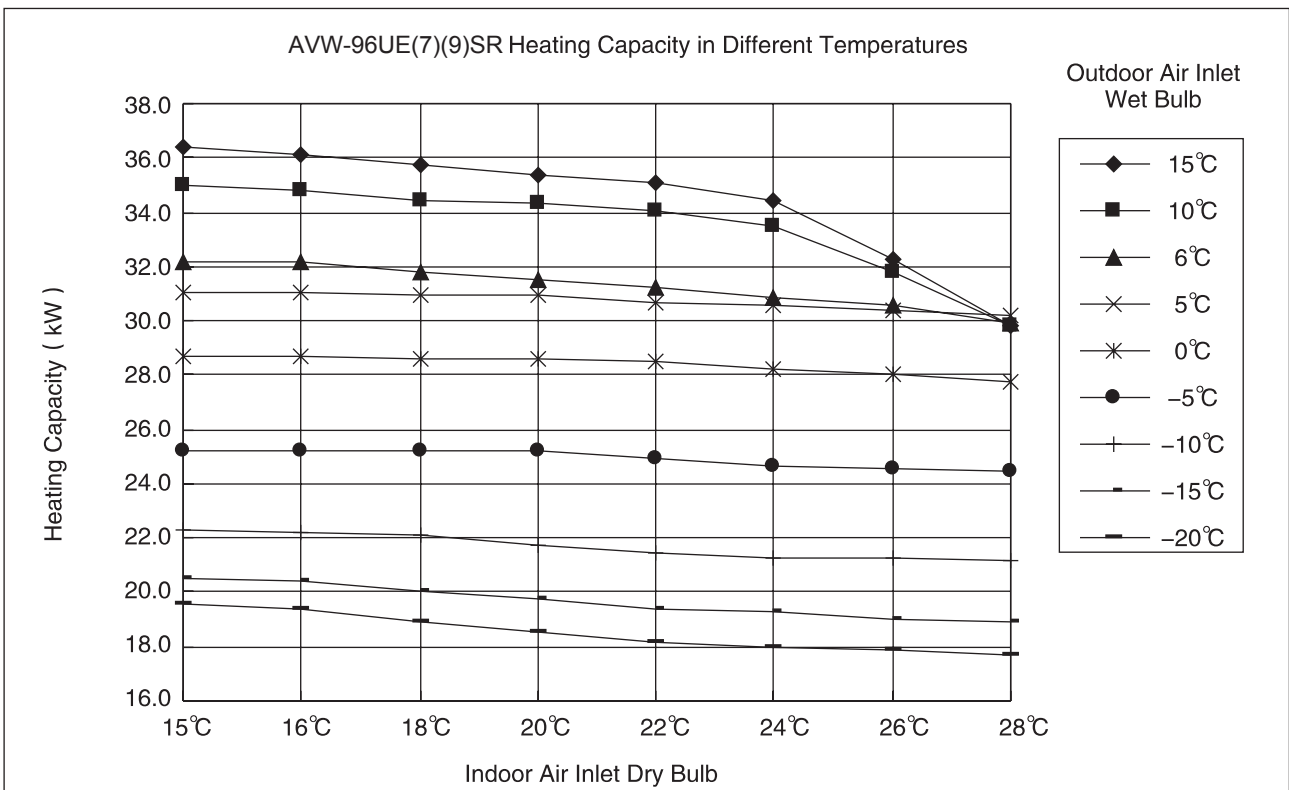
		Heating Capacity								Unit: kW
Outdoor Air Inlet Wet Bulb (°C)	Indoor Air Inlet Dry Bulb (°C)	15°C	16°C	18°C	20°C	22°C	24°C	26°C	28°C	
	15°C		28.8	28.7	28.3	28.1	27.9	27.7	25.7	23.9
10°C		27.8	27.6	27.4	27.3	27.1	27.0	25.5	23.9	
6°C		25.3	25.3	25.0	25.0	25.0	24.8	24.5	23.9	
5°C		24.6	24.6	24.6	24.6	24.4	24.3	24.1	23.9	
0°C		22.8	22.8	22.7	22.7	22.6	22.4	22.2	22.0	
-5°C		20.0	20.0	20.0	20.0	19.8	19.6	19.5	19.4	
-10°C		17.7	17.6	17.5	17.3	17.1	16.9	16.9	16.8	
-15°C		16.3	16.2	15.9	15.7	15.4	15.3	15.1	15.0	
-20°C		15.6	15.4	15.0	14.7	14.4	14.3	14.2	14.1	



2. AVW-96UE(7)(9)SR

Heating Temp. Correction Factor								
Indoor Air Inlet Dry Bulb (°C) \ Outdoor Air Inlet Wet Bulb (°C)	15°C	16°C	18°C	20°C	22°C	24°C	26°C	28°C
15°C	1.15	1.15	1.13	1.12	1.11	1.09	1.02	0.95
10°C	1.11	1.11	1.09	1.09	1.08	1.06	1.01	0.95
6°C	1.02	1.02	1.01	1.00	0.99	0.98	0.97	0.95
5°C	0.99	0.99	0.98	0.98	0.98	0.97	0.96	0.96
0°C	0.91	0.91	0.91	0.91	0.90	0.90	0.89	0.88
-5°C	0.80	0.80	0.80	0.80	0.79	0.78	0.78	0.78
-10°C	0.71	0.71	0.70	0.69	0.68	0.68	0.68	0.67
-15°C	0.65	0.65	0.64	0.63	0.62	0.61	0.60	0.60
-20°C	0.62	0.62	0.60	0.59	0.58	0.57	0.57	0.56

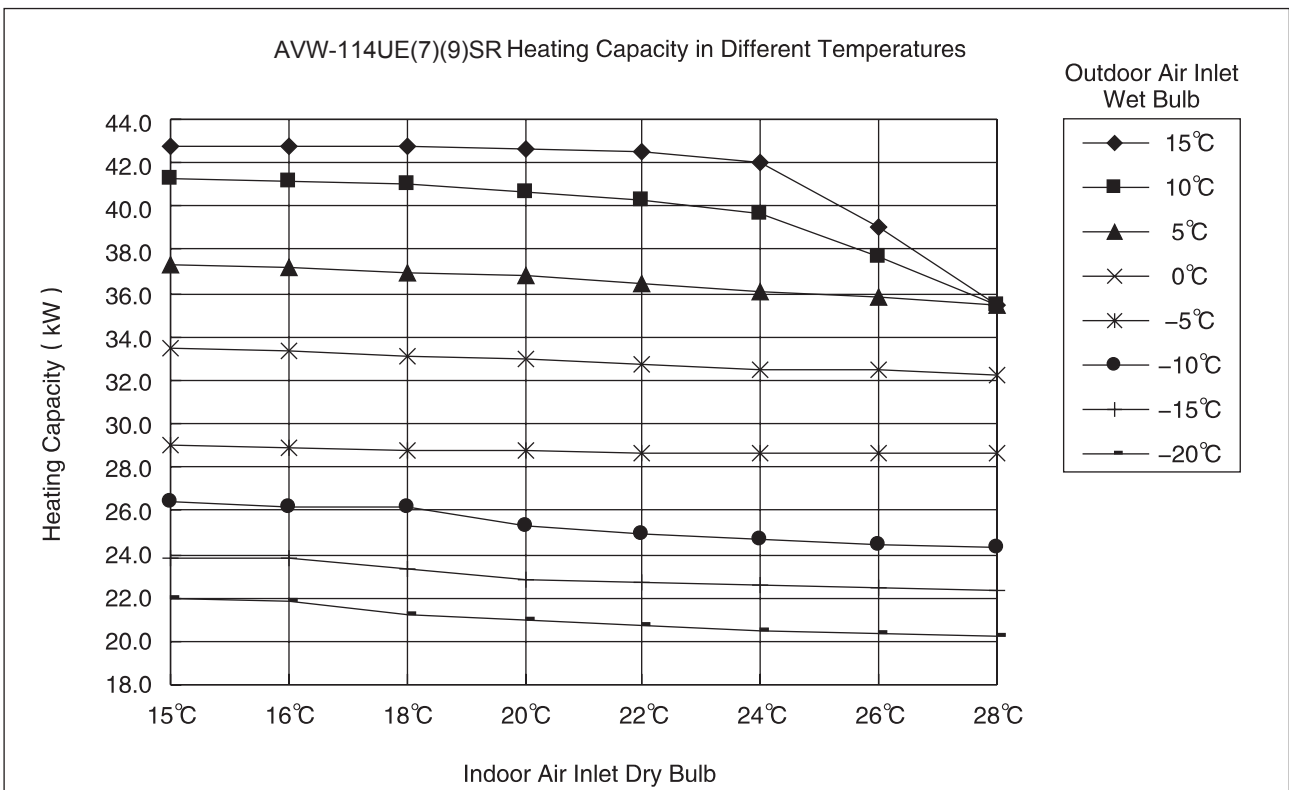
Heating Capacity									Unit: kW
Indoor Air Inlet Dry Bulb (°C) \ Outdoor Air Inlet Wet Bulb (°C)	15°C	16°C	18°C	20°C	22°C	24°C	26°C	28°C	
15°C	36.4	36.1	35.7	35.4	35.1	34.5	32.2	29.8	
10°C	35.0	34.8	34.5	34.3	34.0	33.5	31.8	29.8	
6°C	32.1	32.1	31.8	31.5	31.2	30.9	30.6	29.9	
5°C	31.1	31.1	30.9	30.9	30.7	30.6	30.4	30.2	
0°C	28.7	28.7	28.6	28.6	28.5	28.2	28.0	27.8	
-5°C	25.2	25.2	25.2	25.2	24.9	24.7	24.6	24.5	
-10°C	22.3	22.2	22.1	21.7	21.5	21.3	21.3	21.1	
-15°C	20.6	20.4	20.1	19.7	19.4	19.3	19.0	18.9	
-20°C	19.6	19.4	18.9	18.5	18.2	18.0	17.8	17.7	



3. AVW-114UE(7)(9)SR

Heating Temp. Correction Factor								
Indoor Air Inlet Dry Bulb (°C) \ Outdoor Air Inlet Wet Bulb (°C)	15°C	16°C	18°C	20°C	22°C	24°C	26°C	28°C
15°C	1.14	1.14	1.14	1.14	1.13	1.12	1.04	0.94
10°C	1.10	1.10	1.09	1.09	1.07	1.06	1.01	0.94
6°C	1.01	1.01	1.01	1.00	0.99	0.98	0.97	0.94
5°C	0.99	0.99	0.99	0.98	0.97	0.96	0.95	0.94
0°C	0.89	0.89	0.88	0.88	0.87	0.87	0.86	0.86
-5°C	0.77	0.77	0.77	0.77	0.76	0.76	0.76	0.76
-10°C	0.70	0.70	0.70	0.67	0.66	0.66	0.65	0.65
-15°C	0.64	0.63	0.62	0.61	0.61	0.60	0.60	0.60
-20°C	0.58	0.58	0.57	0.56	0.55	0.55	0.54	0.54

Heating Capacity									Unit: kW
Indoor Air Inlet Dry Bulb (°C) \ Outdoor Air Inlet Wet Bulb (°C)	15°C	16°C	18°C	20°C	22°C	24°C	26°C	28°C	
15°C	42.8	42.8	42.7	42.6	42.5	42.0	39.1	35.4	
10°C	41.3	41.2	41.0	40.7	40.3	39.7	37.7	35.4	
6°C	37.9	37.9	37.9	37.5	37.1	36.8	36.4	35.3	
5°C	37.3	37.2	37.0	36.8	36.4	36.1	35.8	35.4	
0°C	33.5	33.4	33.2	32.9	32.7	32.5	32.4	32.2	
-5°C	29.0	28.9	28.8	28.8	28.7	28.7	28.7	28.7	
-10°C	26.4	26.2	26.1	25.3	24.9	24.7	24.5	24.3	
-15°C	23.9	23.8	23.4	22.8	22.7	22.5	22.4	22.3	
-20°C	21.9	21.8	21.2	21.0	20.7	20.5	20.3	20.2	





## 4.5 Piping Length Correction Factor

Correction Factor for Cooling Capacity According to Piping Length

The cooling capacity should be corrected according to the following formula:

$$CCA = CC \times F$$

CCA: Actual Corrected Cooling Capacity (kcal/h)

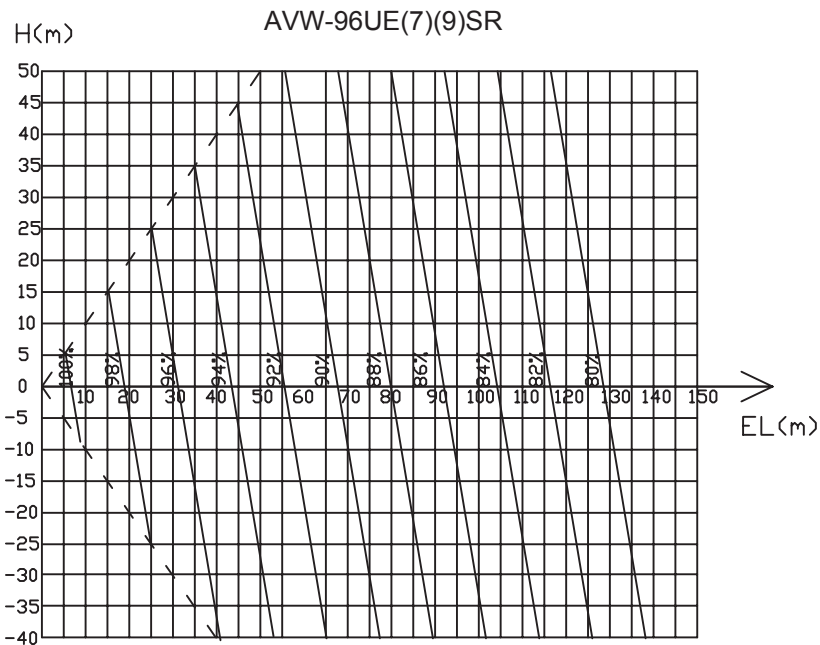
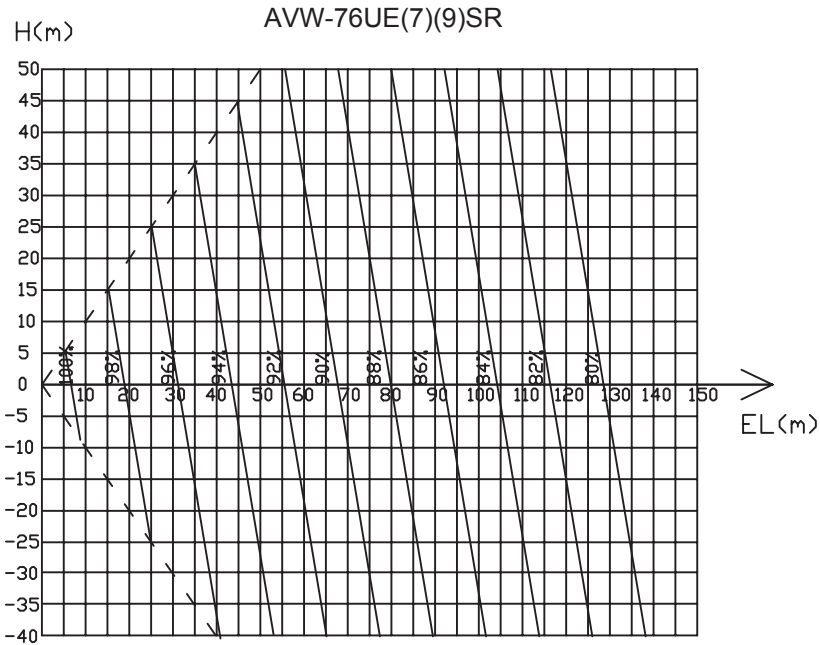
CC: Cooling Capacity in the Performance Table (kcal/h)

F: Correction Factor Based on the Equivalent Piping Length

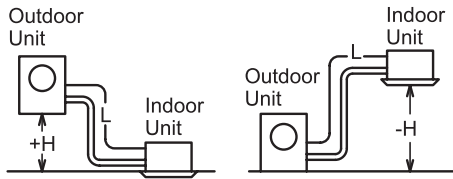
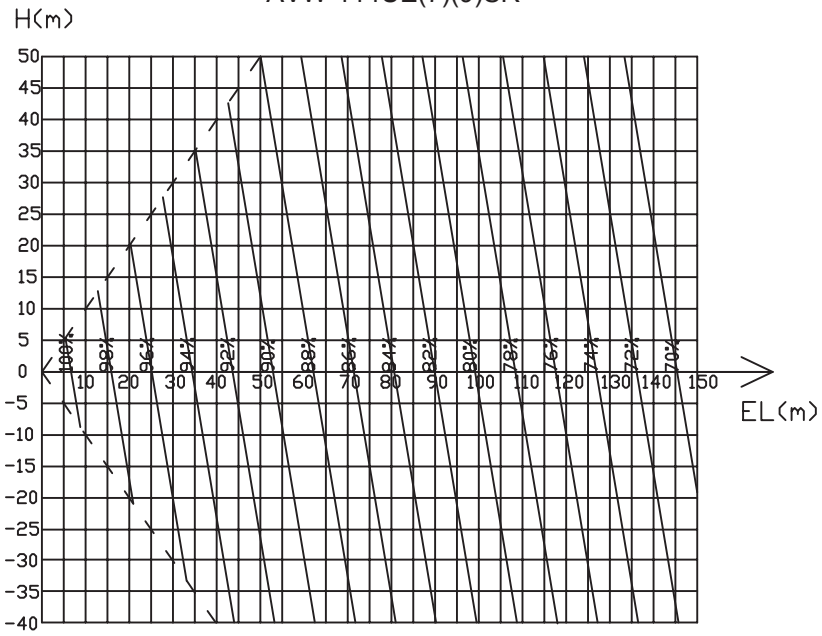
The correction factors are shown in the following figure.

Equivalent Piping Length for

- One 90° Elbow is 0.5m.
- One 180° Bend is 1.5m.
- One 180 Multi-Kit is 0.5m.



AVW-114UE(7)(9)SR



- H: Vertical Distance Between Indoor Unit and Outdoor Unit in Meters
- EL: Equivalent Total Distance Between Indoor Unit and Outdoor Unit in Meters (Equivalent One-Way Piping Length)
- H>0: Position of Outdoor Unit Higher Than Position of Indoor Unit
- L: Actual One-Way Piping Length Between Indoor Unit and Outdoor Unit in Meters

### Correction Factor for Heating Capacity According to Piping Length

The heating capacity should be corrected according to the following formula:

$$HCA = HC \times F$$

HCA: Actual Corrected Heating Capacity (kcal/h)

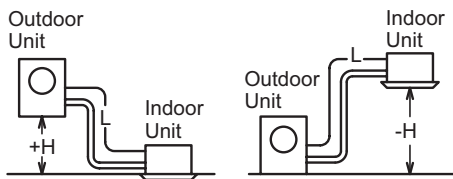
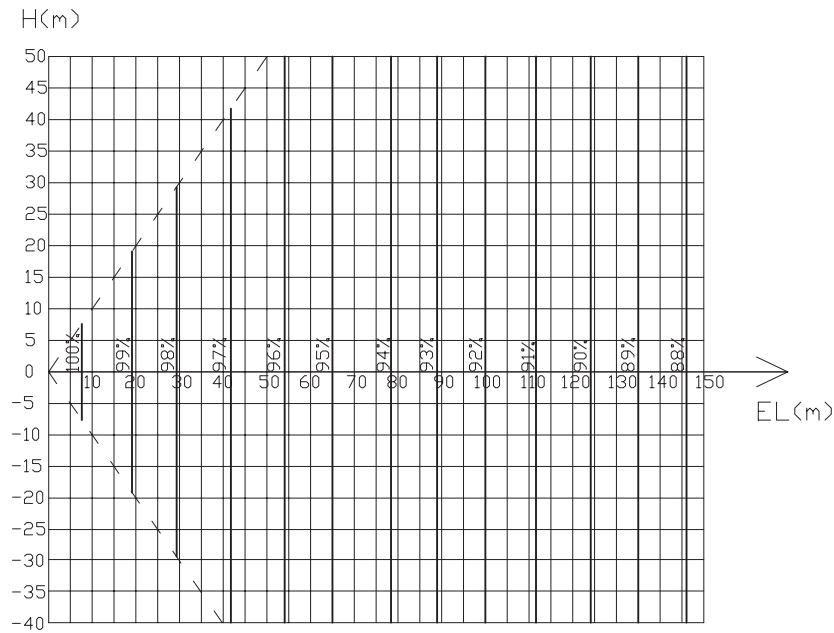
HC: Heating Capacity in the Performance Table (kcal/h)

F: Correction Factor Based on the Equivalent Piping Length

The correction factors are shown in the following figure.

Equivalent Piping Length for

- One 90° Elbow is 0.5m.
- One 180° Bend is 1.5m.
- One 180 Multi-Kit is 0.5m.



H: Vertical Distance Between Indoor Unit and Outdoor Unit in Meters

EL: Equivalent Total Distance Between Indoor Unit and Outdoor Unit in Meters (Equivalent One-Way Piping Length)

H>0: Position of Outdoor Unit Higher Than Position of Indoor Unit

L: Actual One-Way Piping Length Between Indoor Unit and Outdoor Unit in Meters

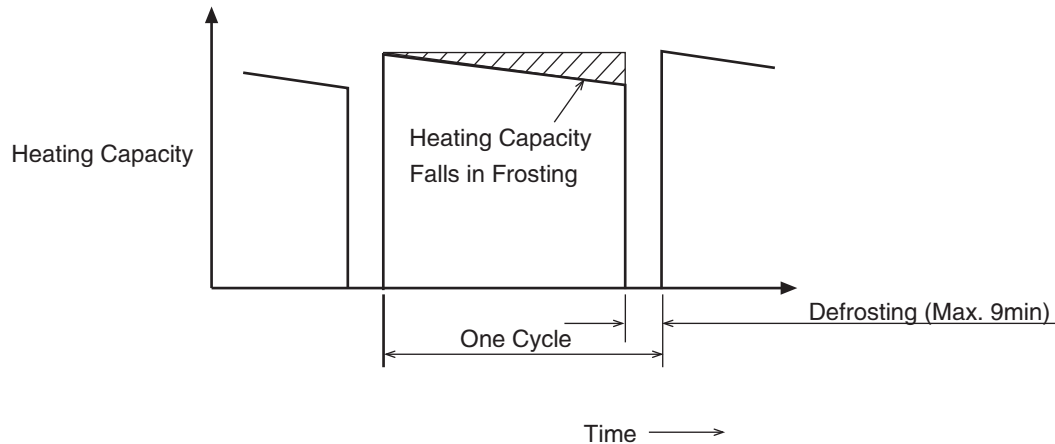
## 4.6 Defrosting Correction Factor

The heating capacity in the preceding paragraph excludes the condition of frosting or defrosting operation. In consideration of frosting or defrosting operation, the heating capacity is corrected by the equation below.

Corrected heating capacity= correction factor X heating capacity

Outdoor Temp.DB (°CDB) (Relative Humidity 85%RH)	-7	-5	-3	0	3	5	7
Correction Factor	0.95	0.93	0.88	0.85	0.87	0.90	1.0

Note: The Correction Factor is not suitable for special operations like a snowfall or the operation in a transitional period.



## 4.7 Sensible Heat Factor (SHF)

Refer to <HI-FLEXI M Series >

## 4.8 Fan Performance

Refer to <HI-FLEXI M Series >

## 5. Electrical Data

Outdoor Unit

Model	Main Power	Applicable Voltage		Cooling Operation		Heating Operation		Max. Current
		Max.	Min.	RLA	IPT	RLA	IPT	MRC
AVW-76UESR	3Φ, 380-415V /50Hz	457	342	10.3	6.3	9.6	5.9	20.5
AVW-96UESR				13.6	8.3	12.7	7.8	26
AVW-114UESR				17.3	10.7	16.0	9.9	26
AVW-76U7SR	3Φ, 380V/60Hz	418	342	10.3	6.3	9.6	5.9	20.5
AVW-96U7SR				13.6	8.3	12.7	7.8	26
AVW-114U7SR				17.3	10.7	16.0	9.9	26
AVW-76U9SR	3Φ, 220V/60Hz	242	198	17.8	6.3	16.6	5.9	22.0
AVW-96U9SR				23.4	8.3	22.0	7.8	29.0
AVW-114U9SR				29.9	10.7	27.6	9.9	37.0

RLA: Rated Load Current(A)

IPT: Rated Input(kW)

### NOTES:

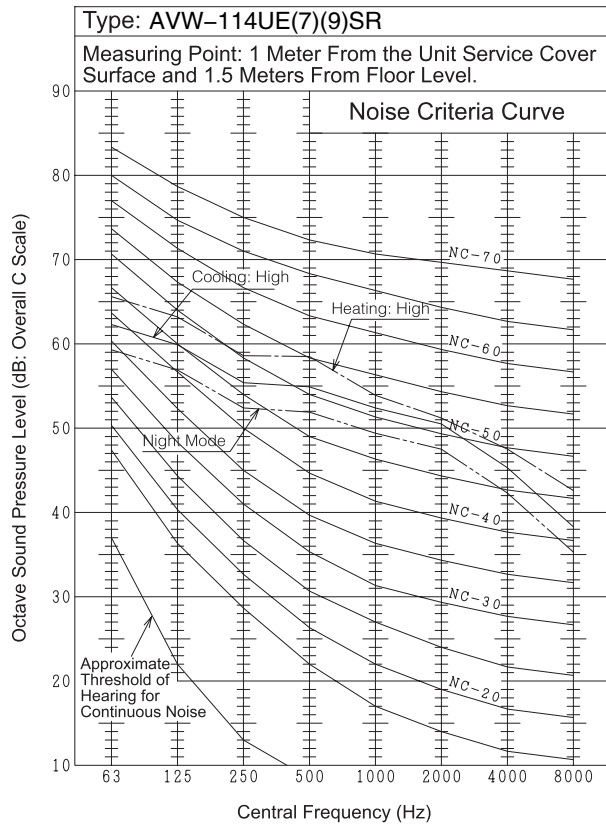
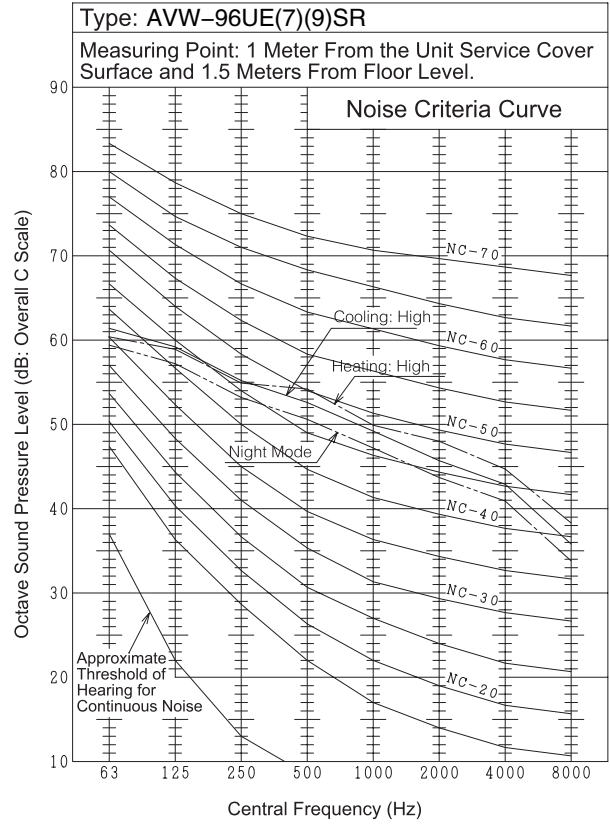
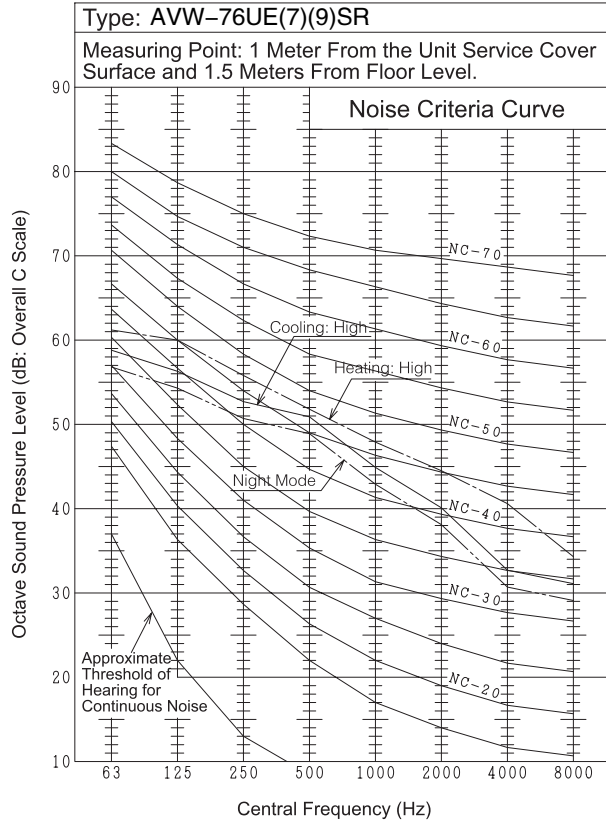
1. The above compressor data is based on 100% capacity combination of the indoor units at rated operating frequency.
2. The above performance data is based on 7.5m equivalent piping length and 0m piping lift.
3. These data are based on the same conditions as the nominal heating and cooling capacities.
4. The compressor is started by an inverter, resulting in extremely low starting current.

## 6. Sound Data

### Indoor Unit

Refer to the <HI-FLEXI M Series>

### Outdoor Unit



## 7. Working Range

### Power Supply

Working Voltage: 90% to 110% of the rated voltage

Voltage Imbalance: within a 3% deviation from each voltage at the main terminal of outdoor unit

Starting Voltage: higher than 85% of the rated voltage

### Temperature Range

The temperature ranges are shown as follows.



Temperature (°C)

		Max	Min
Cooling Operation	Indoor	23 WB	15WB
	Outdoor	43 DB	-15DB
Heating Operation	Indoor	30 DB	15DB
	Outdoor	17 WB	-20 WB



DB: dry bulb temperature  
WB: wet bulb temperature

## 8. Optional Accessories

### Receiver Kit for Wireless Control

HYRE-V01H	HYRE-T01H	NOTE
		HYRE-V01H is for Low/High Static Pressure Ceiling Ducted Type. HYRE-T01H is for 4-Way Cassette Type.

### Drain-up Mechanism Kit – Optional

HPS-132/HPS-162	HPS-151	NOTE
		*HPS-132 is for the Ceiling Ducted Types(L/H) with cooling capacity not more than 2.5HP. *HPS-162 is for the Ceiling Ducted Types(L/H) with cooling capacity not less than 3.0HP. *HPS-151 is external, and it is for general purpose.

## 9. Component Data

### ● Heat Exchanger and Fan Motor of Outdoor Unit

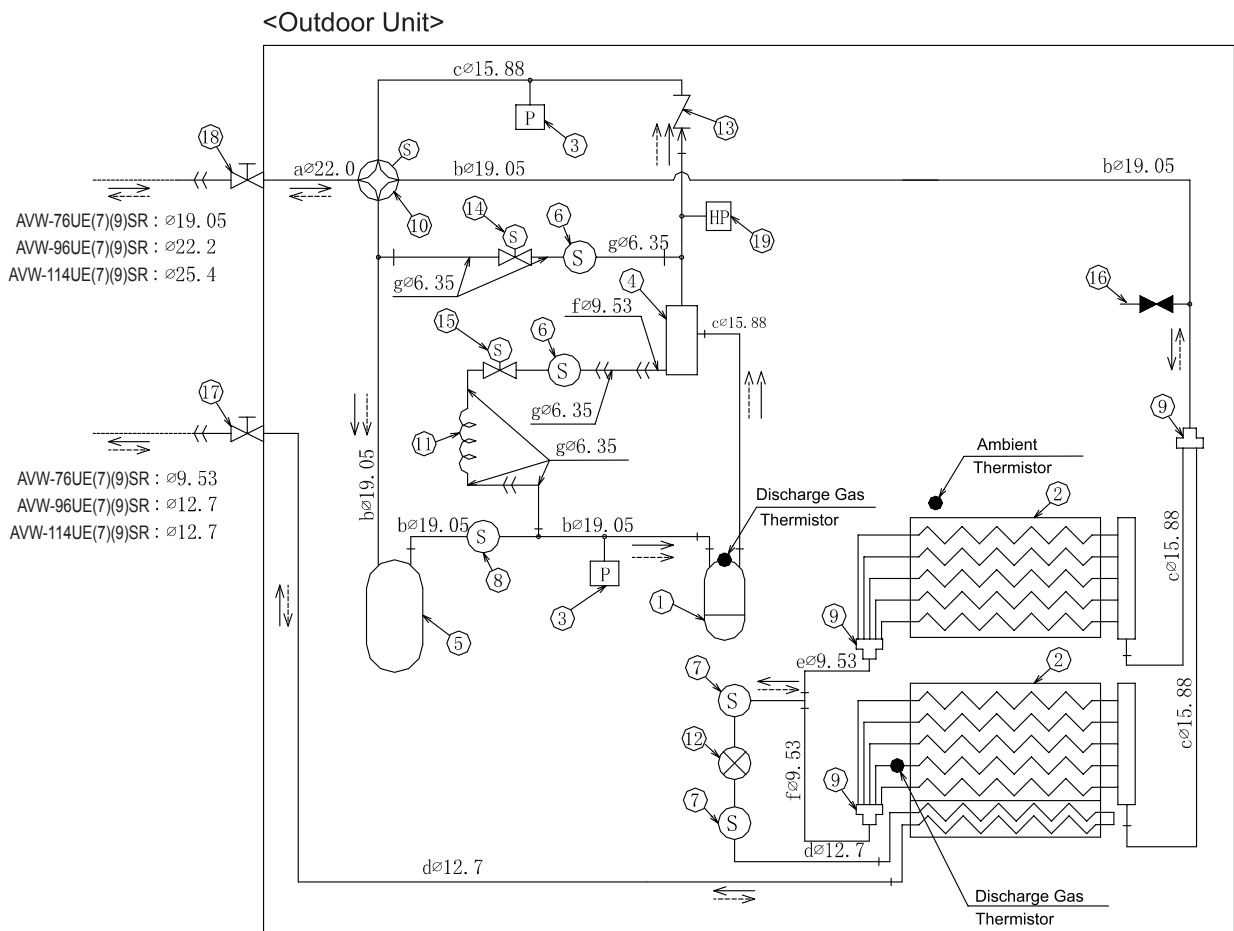
			AVW-76UE(7)(9)SR	AVW-96UE(7)(9)SR	AVW-114UE(7)(9)SR	
Heat Exchanger	Model		Multi-pass Cross Finned Tube			
	Tube	Material	Copper Tube			
		Outer Diameter	mm	7.0	7.0	7.0
		Rows		2	2	2
		Numbers		80	80	80
	Fin	Material	Aluminium			
		Pitch	mm	1.9	1.9	1.9
	Maximum Operating Pressure		Mpa	4.15	4.15	4.15
Total Face Area		m <sup>2</sup>	1.86	1.86	1.86	
Number			2	2	2	
Fan	Fan	Model	Propeller Fan Motor			
		Outer Diameter	mm	544	544	544
		Revolution (220V/240V)	rpm	399+745	630+772	630+871
		Nominal Air Flow	m <sup>3</sup> /h	121	150	163
	Fan Motor	Type	Drip-Proof Type Enclosure			
		Starting Method	DC Driven			
		Output	W	170+120	170+120	170+200
		Number		2		
		Insulation Class		E		

### Compressor Data

Model			E656DHD
Style			Hermetic Scroll Type
Air Tight Pressure	Discharge	MPa	4.20
	Suction	MPa	2.21
Compressor Motor	Type	Special Squirrel-cage 3-phase Motor	
	Starting Method	Inverter Driven	
	Poles	4	
	Insulation Class	E	
Oil	Type	FVC68D	
	Charge	L	1.9

# 10. Control System

## 10.1 Refrigerant Cycle



- ← : Refrigerant Flow Direction(Cooling Operation)
- ←- : Refrigerant Flow Direction(Heating Operation)
- - - : Field Refrigerant Piping
- == : Flare Connection
- + : Brazing Connection
- +| : Flange Connection

Mark	Part Name
①	Compressor
②	Heat Exchanger
③	Sensor for Refrigerant Pressure
④	Oil Separator
⑤	Accumulator
⑥	Strainer(3/8)
⑦	Strainer(1/2)
⑧	Strainer(3/4)
⑨	Distributor
⑩	Reversing Valve
⑪	Capillary Tube
⑫	Electronic Expansion Valve
⑬	Check Valve
⑭	Solenoid Valve
⑮	Solenoid Valve
⑯	Check Joint
⑰	Stop Valve for Liquid Line
⑱	Stop Valve for Gas Line
⑲	High Pressure Switch for Protection

Mark	O. D. x T	Material
a	$\phi$ 22.0 x 1.5 t	C1220T-0
b	$\phi$ 19.05 x 1.65 t	
c	$\phi$ 15.88 x 1.2 t	
d	$\phi$ 12.7 x 1.0 t	
e	$\phi$ 9.53 x 1.0 t	
f	$\phi$ 9.53 x 0.8 t	
g	$\phi$ 6.35 x 1.07 t	



## 10.2 Function Control Unit

Table 1 shows the control system of refrigerant cycle

Table 1. Refrigerant Cycle

Control Subject	Purpose	
	Cooling Operation	Heating Operation
Inverter Frequency of Compressor	1.Total operating I.U. capacity control 2.Refrigerant piping length control 3.Discharge pressure control.	1.Total operating I.U. capacity control 2.Refrigerant piping length control 3.Discharge pressure control.
Opening Degree of Expansion Valve of O.U.	1.Open	1.Control super-heat of discharge gas, TdSH
Opening Degree of Expansion Valve of I.U.	1.Control super-heat of discharge gas, TdSH 2.Control temp. difference between gas and liquid pipe of I.U.heat exchanger 3.Balance temp. differences between gas and liquid pipe of each I.U.	1.Control temp. difference between air outlet and inlet of I.U. 2.Balance temp. differences between gas and liquid pipe of each I.U.
Outdoor Fan	1.Control discharge pressure	1.Control pressure based on outdoor air temp. and running capacity

## 10.3 System Control

### 10.3.1 Indoor Remote Control

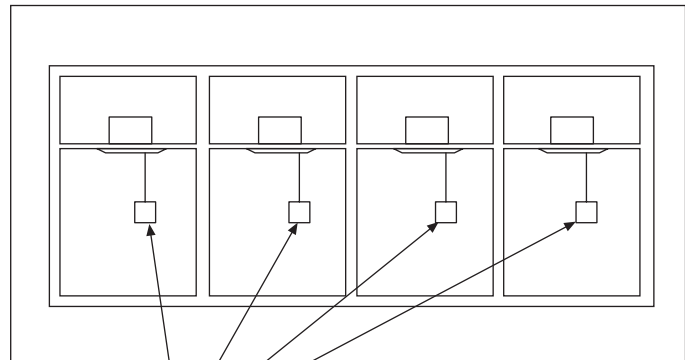
#### Independant Operating System for Multiple Units

“One for One” control: each indoor unit is individually controlled by its own remote control switch.

Control Method	One for One
Operation Mode	Individual
1. ON/OFF	Yes
2. Setting of Operation Mode	Yes*
3. Room Temperature Setting	Yes
4. Fan Speed Setting	Yes
5. Timer Setting	Yes
6. ON/OFF by Timer Control	Yes
7. Operation Indication	Yes
8. Alarm Indication	Yes
9. Self-checking	Yes
10. Test Mode	Yes

\*: Cooling and heating can not be operated simultaneously

Individual Control



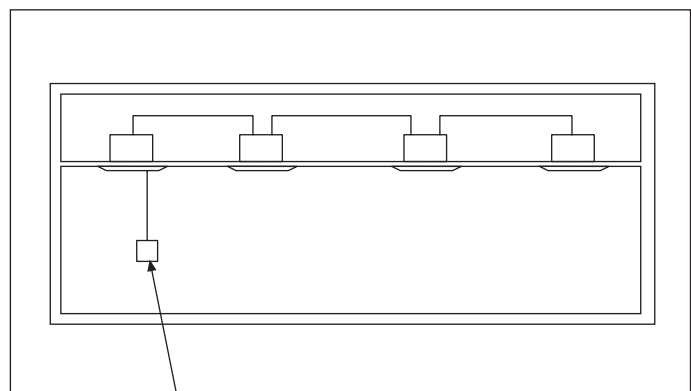
Remote Control Switch

#### Group Control Operating System

One remote control switch can control simultaneously up to 16 indoor units, which is suitable for spacious places like hospital, lobby of hotel, office building, etc. One remote control can start and stop all indoor units easily and quickly.

Control Method	One Remote Control
Operation Mode	Unit
1. ON/OFF	Yes
2. Setting of Operation Mode	Yes
3. Room Temperature Setting	Yes
4. Fan Speed Setting	Yes
5. Timer Setting	Yes
6. ON/OFF by Timer Control	Yes
7. Operation Indication	Yes
8. Alarm Indication	Yes
9. Self-checking	Yes
10. Test Mode	Yes

Central Control



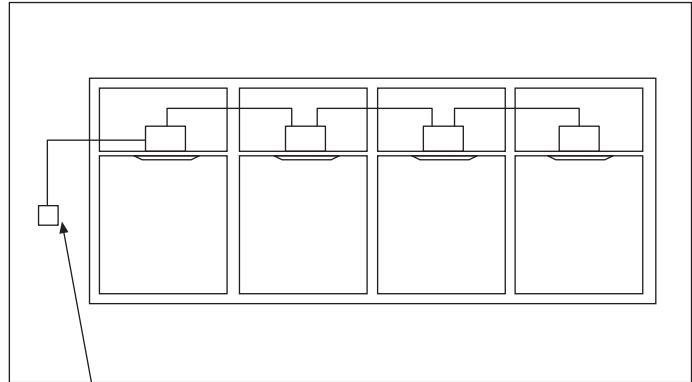
One Remote Control Switch in the Room

### 10.3.2 Long-distance Central Control

One remote control installed in a remote place can control 16 indoor units at the most, which is suitable for a spacious conditioning place, like lobby of hotel, hospital and office building, etc. One remote control makes operation easily and quickly.

Control Method	Group Control
Operation Mode	Individual
1. ON/OFF	Yes
2. Setting of Operation Mode	Yes
3. Room Temperature Setting	Yes
4. Fan Speed Setting	Yes
5. Timer Setting	Yes
6. ON/OFF by Timer Control	Yes
7. Operation Indication	Yes
8. Alarm Indication	Yes
9. Self-checking	Yes
10. Test Mode	Yes

One Time Control



One Remote Control Switch Located Outside of Rooms

### 10.3.3 Indoor Installed Controller/Distant Control

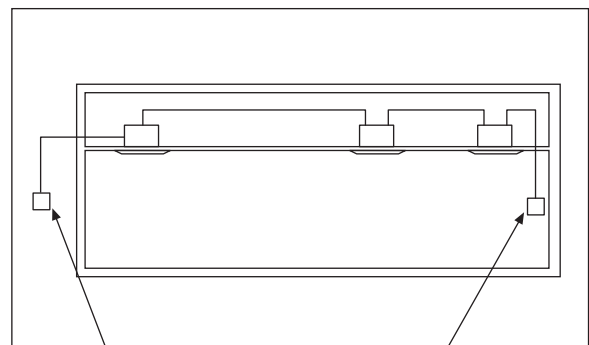
With main and sub remote control switch for maximum 16 indoor units control.

#### Operating System Simultaneously

Two remote control switches HYXE - J01H are applied for control up to 16 indoor units, with one in the room and the other in the distant control room, which is suitable for a spacious conditioning spot like lobby of hotel and canteen, etc.

Control Method	Switch in Room	Switch in the Distance
Operation Mode	One Group	One Group
1. ON/OFF	Yes	Yes
2. Setting of Operation Mode	Yes*	Yes*
3. Room Temperature Setting	Yes	Yes
4. Fan Speed Setting	Yes	Yes
5. Timer Setting	Yes	Yes
6. ON/OFF by Timer Control	Yes	Yes
7. Operation Indication	Yes	Yes
8. Alarm Indication	Yes	Yes
9. Self-checking	Yes	Yes
10. Test Mode	Yes	Yes

Control with Two Switches



Main Remote Control Switch

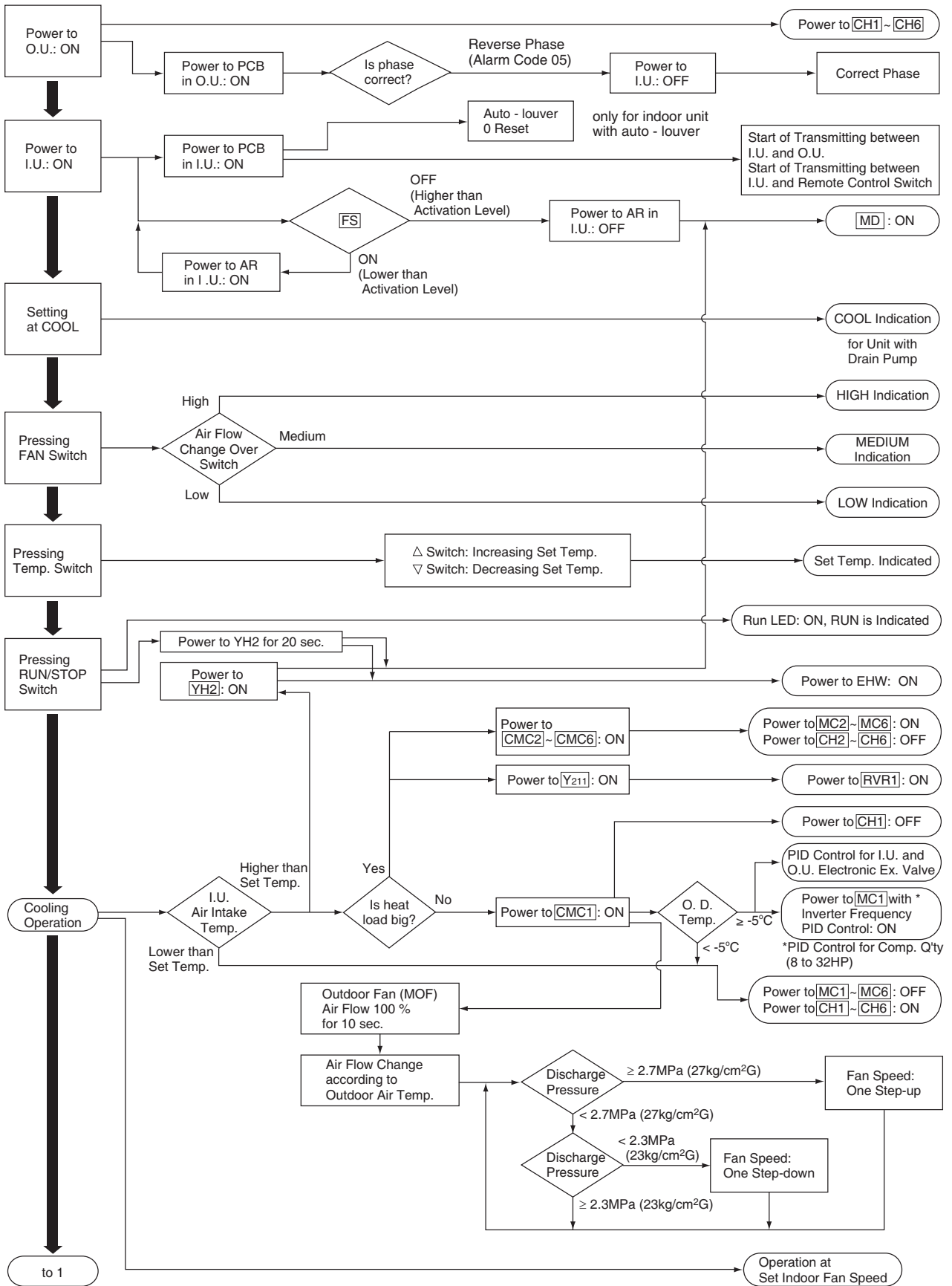
Sub-Remote Control Switch

Note: The last setting remote control switch in the two remote control switches has priority in the system.

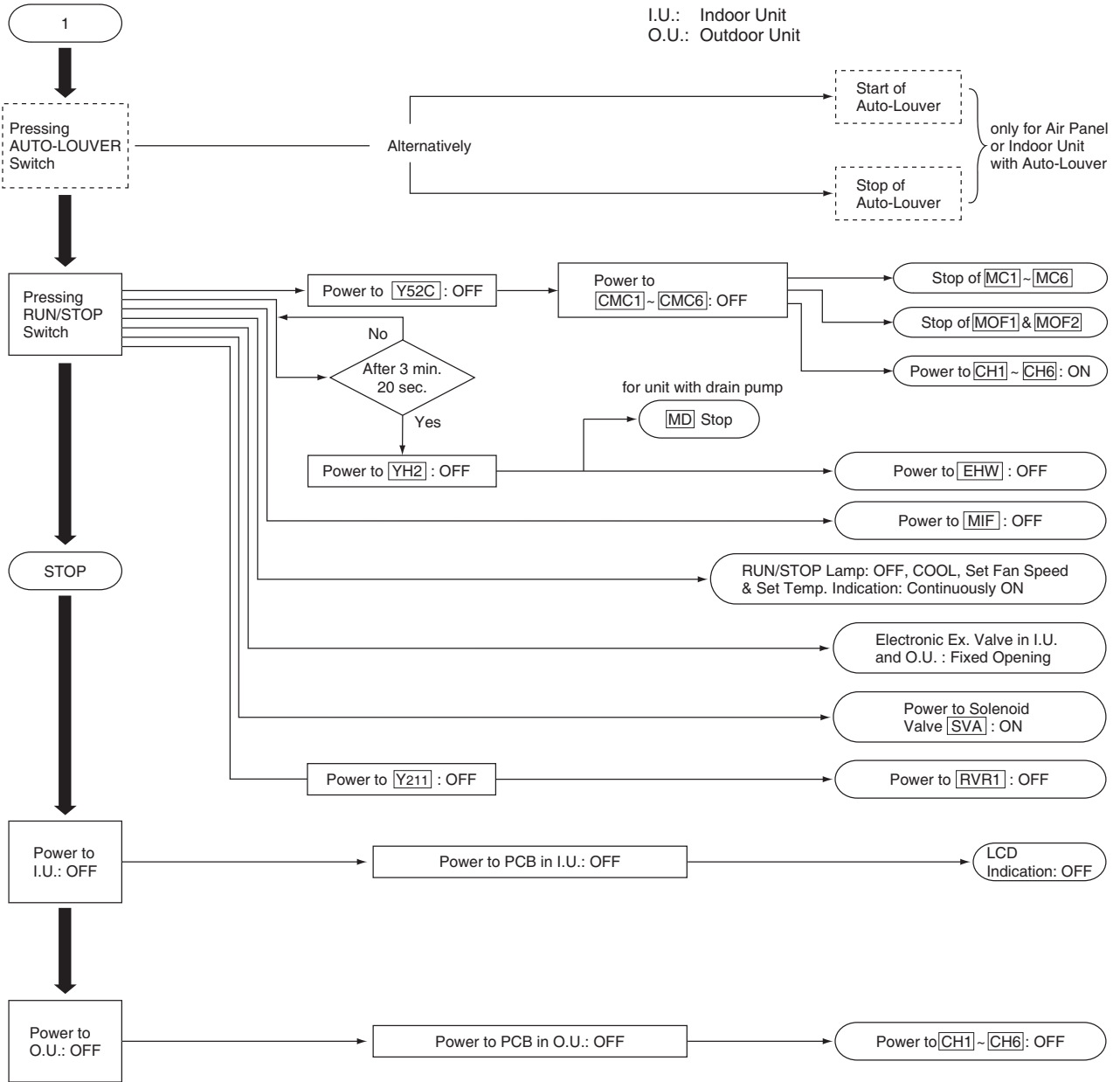
# 10.4 Standard Operation Sequence

## ■ Cooling Operation

I.U.: Indoor Unit  
 O.U.: Outdoor Unit  
 T.C.: Temperature of Condensing

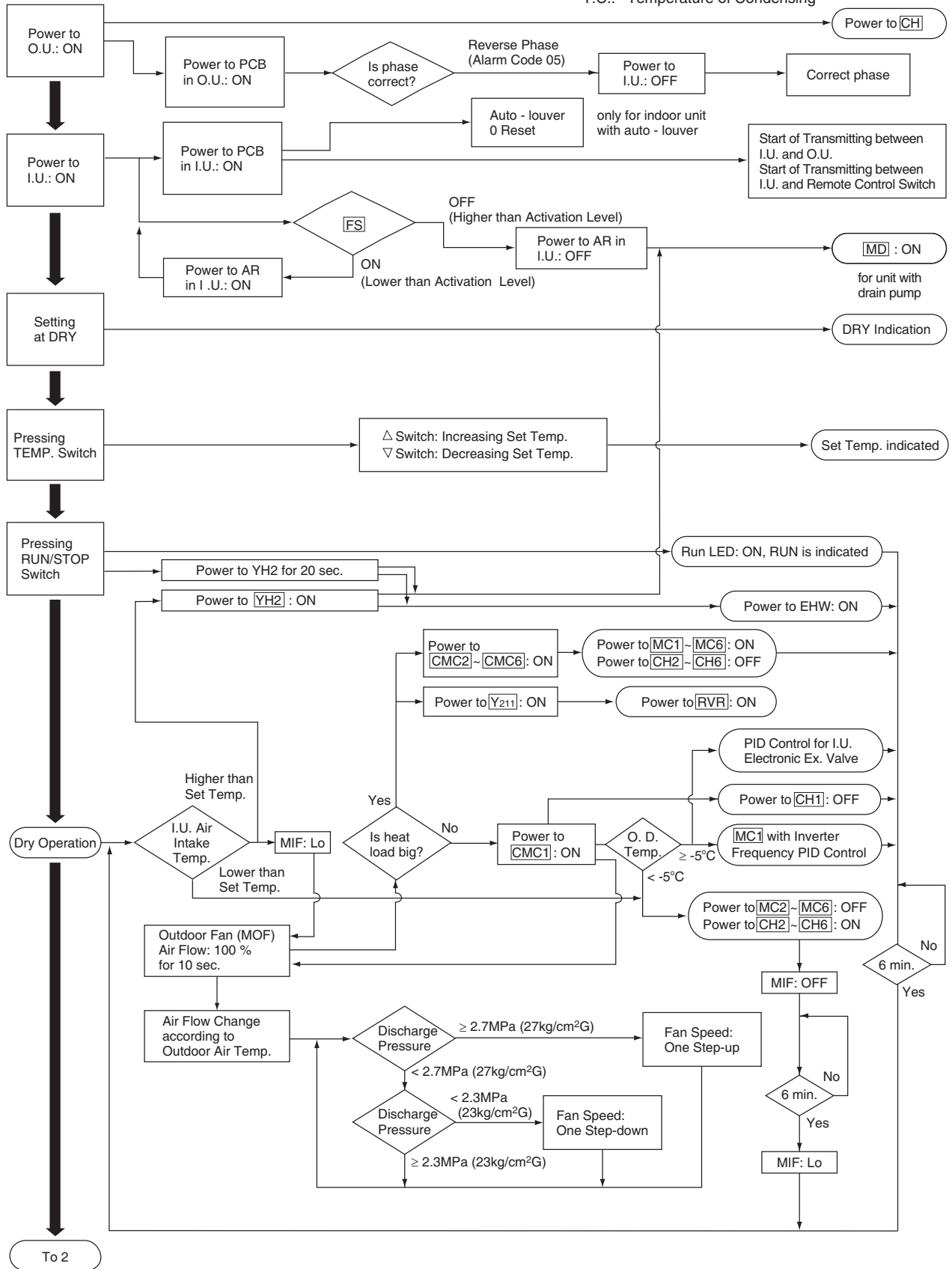


■ Cooling Operation

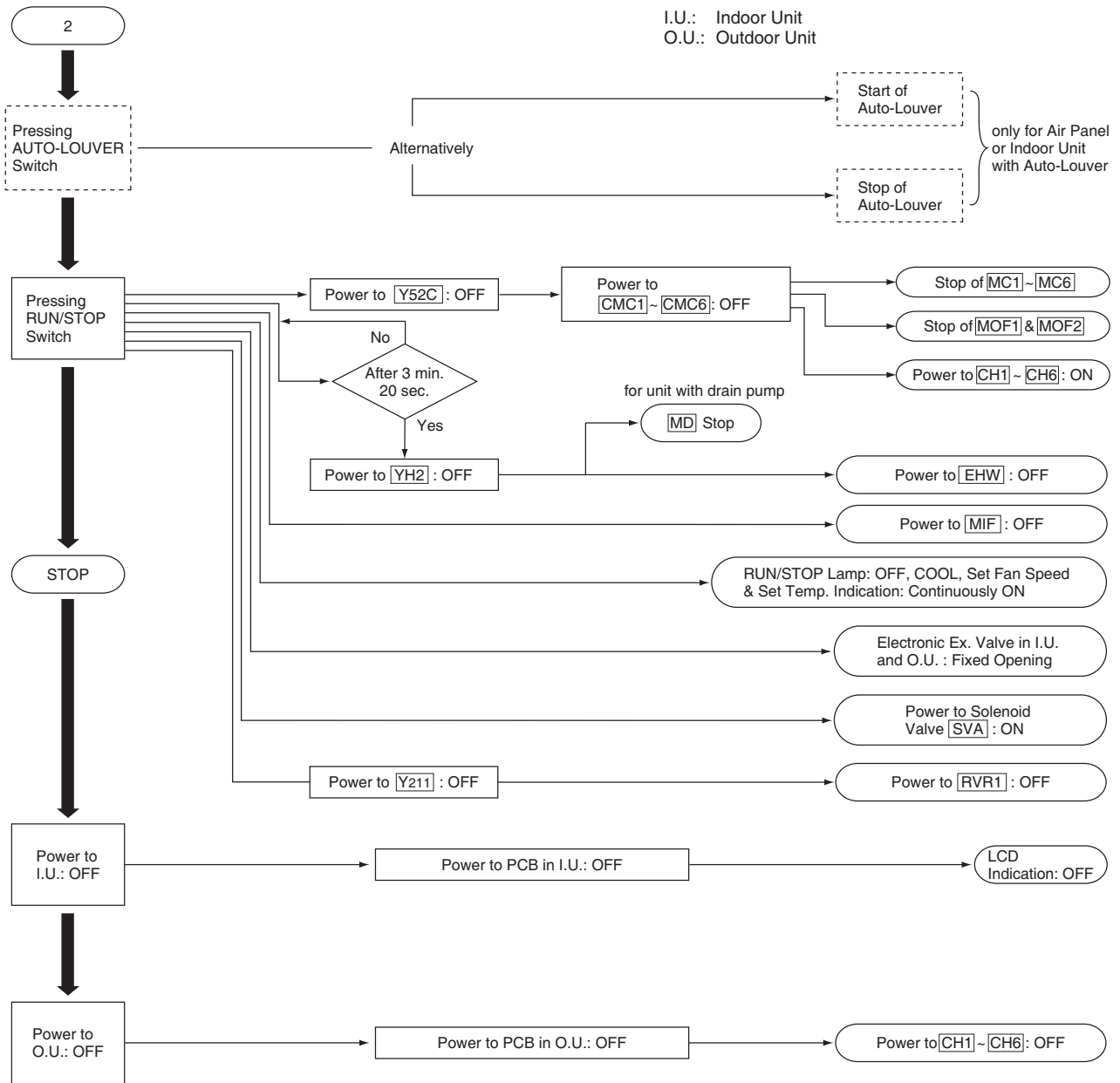


■ Dry Operation

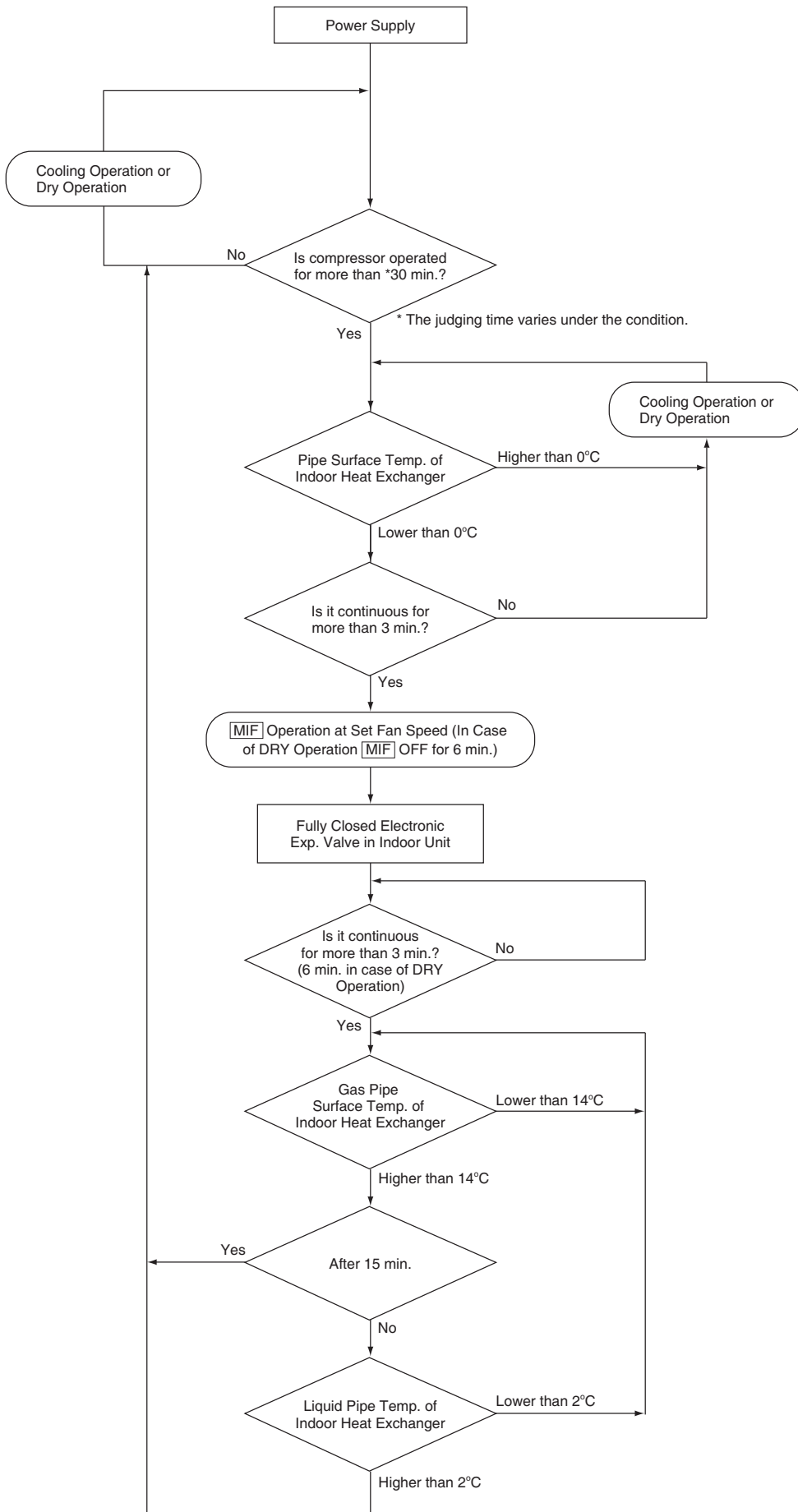
I.U.: Indoor Unit  
 O.U.: Outdoor Unit  
 T.C.: Temperature of Condensing



■ Dry Operation

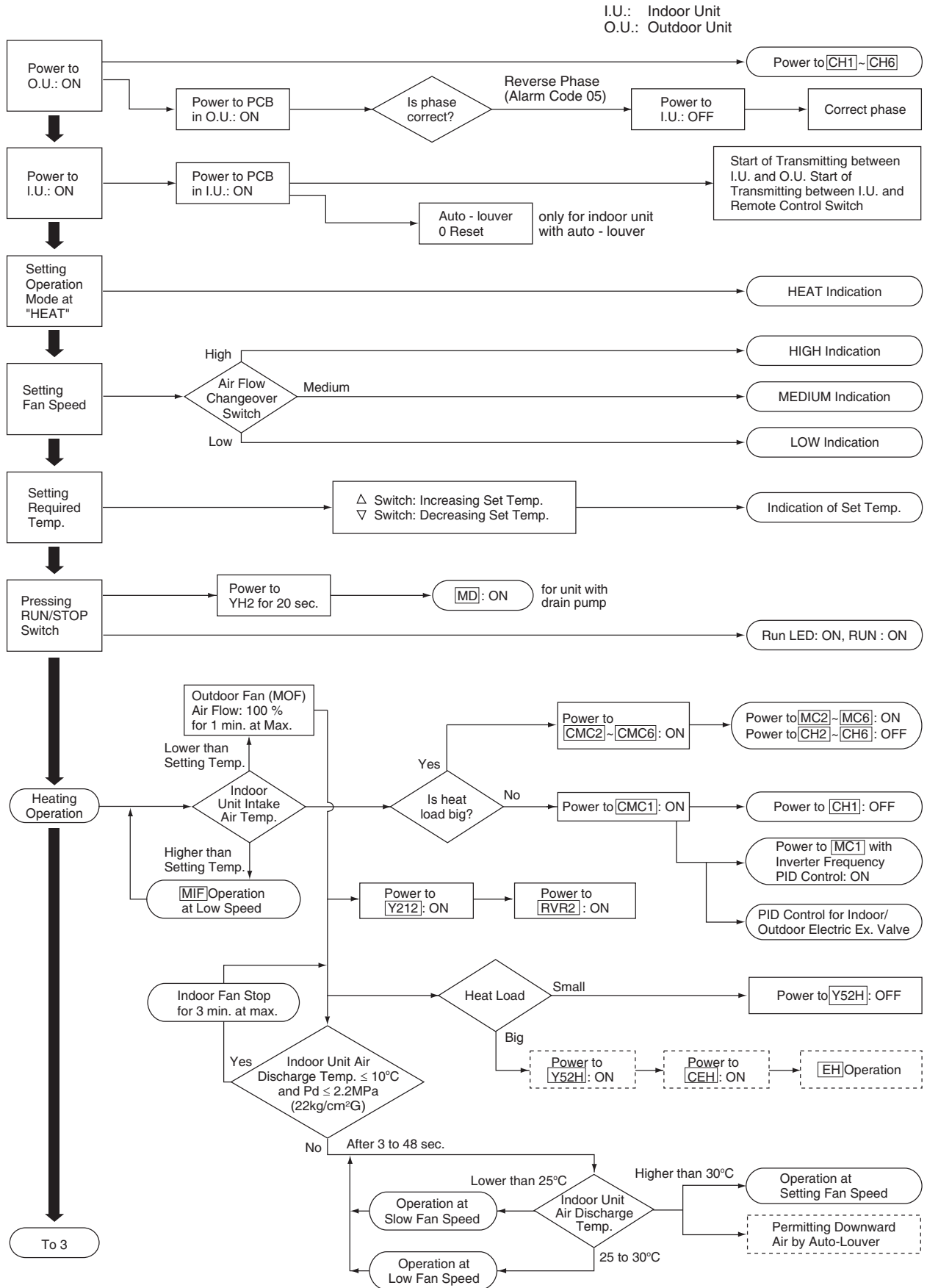


■ Freezing Protection Control during Cooling or Dry Operation

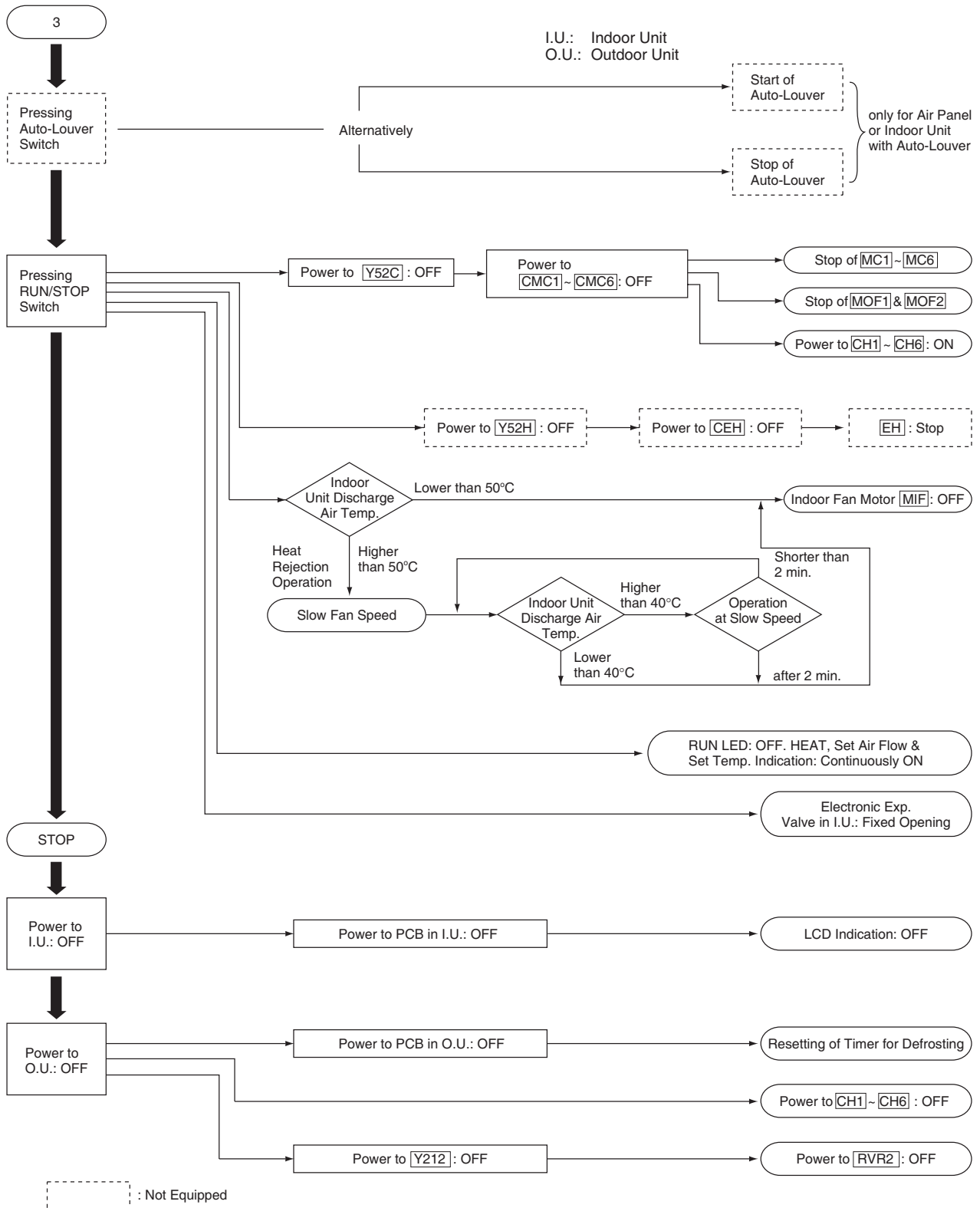




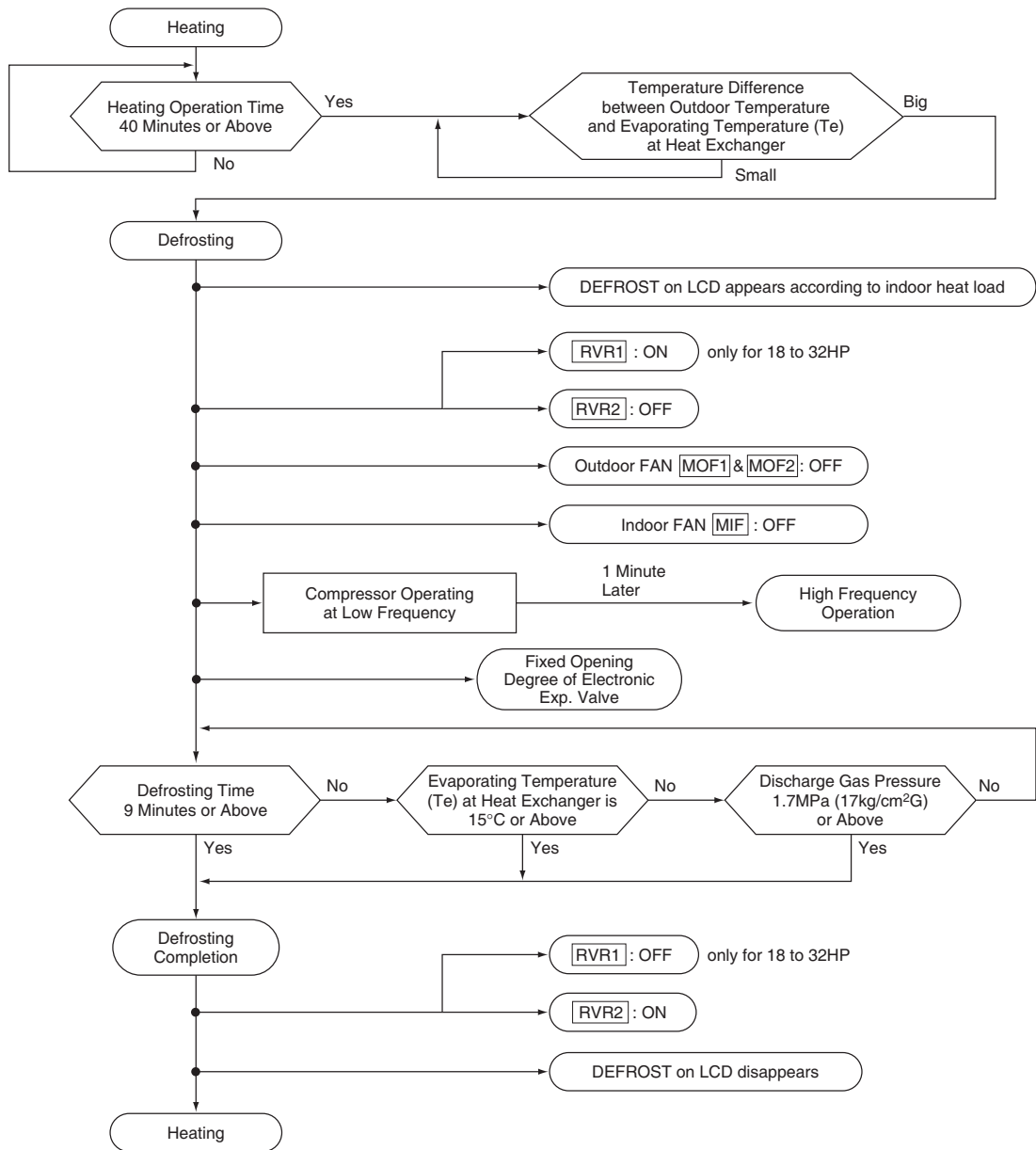
# ■ Heating Operation



# ■ Heating Operation



## ■ Defrosting Operation Control



## 10.5 Protection and Safety Control

### Compressor Protection

The compressor is protected by the following devices and their combinations.

**High Pressure Switch** - This switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.

**Oil Heater** - This band type heater protects against oil Carry-over during cold starting, as it is energized

### Fan Motor Protection

Internal Thermostat-Embedded in the fan motor winding, this internal thermostat cuts out the operation of the fan motor when the fan motor winding temperature exceeds the setting.

while the compressor is stopped.

## 10.6 Safety and Control Device Setting

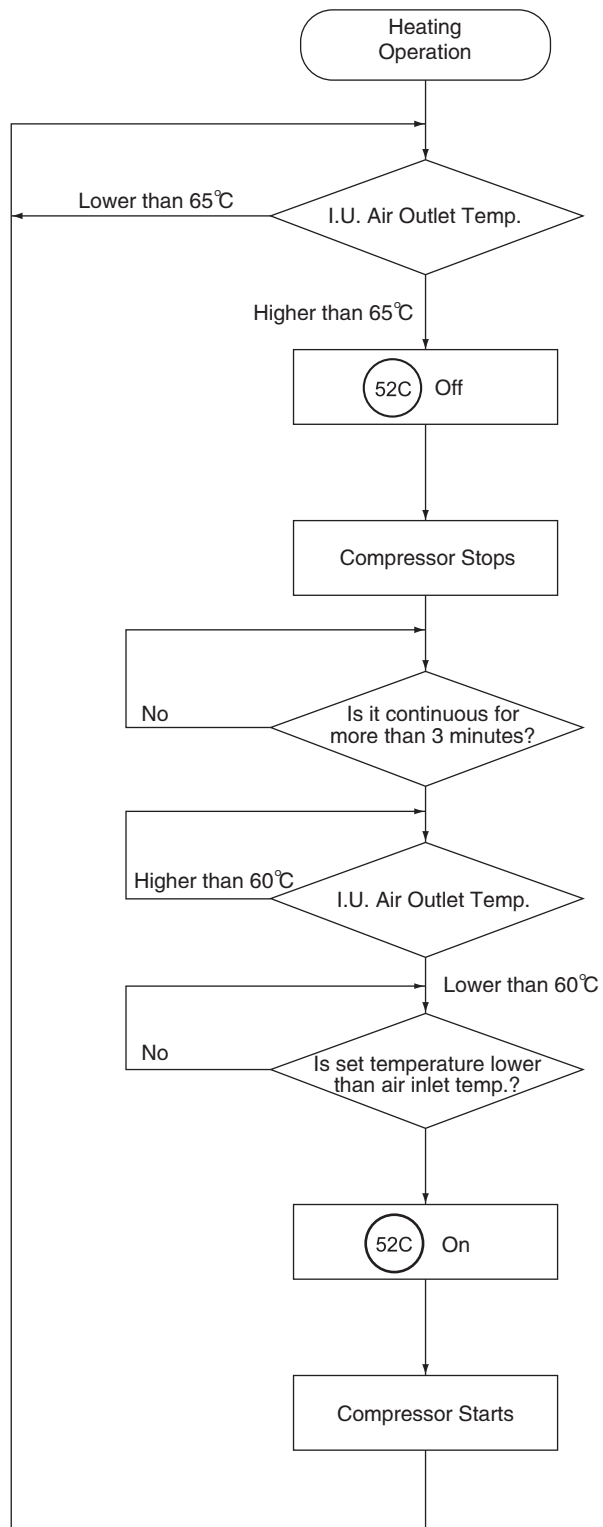
### Safety and Control Device Setting for Indoor Units

Model		AVD/AVE	AVC	AVS	AVH	AVV
For Evaporator Fan Motor Internal Thermostat		Automatic Reset, Non-Adjustable (each one for each motor)				
Cut-Out	°C	130±5	-	-	135±5	120±5
Cut-In	°C	83±15	-	-	90±15	76±15
For Control Circuit Fuse Capacity		A				
Freeze Protection Thermostat						
Cut-Out	°C	0				
Cut-In	°C	14				
Thermostat Differential		°C				
		2				

### Safety and Control Device Setting for Outdoor Units

Type		AVW-76UE(7)(9)SR	AVW-96UE(7)(9)SR	AVW-114UE(7)(9)SR	
Compressor Pressure Switches		Automatic Reset, Non-adjustable			
High Pressure	OFF	MPa	4.15 <sup>-0.05</sup> <sub>-0.15</sub>	4.15 <sup>-0.05</sup> <sub>-0.15</sub>	4.15 <sup>-0.05</sup> <sub>-0.15</sub>
	ON	MPa	3.2 ± 0.15	3.2 ± 0.15	3.2 ± 0.15
Fuse Capacity					
3Φ, 380-415V/50Hz	A	40	40	40	
3Φ, 380/60Hz	A	60	60	60	
CCP Timer		Non-adjustable			
Setting Time	Min	3	3	3	
Condenser Fan Motor Internal Thermostat		Automatic Reset, Non-adjustable (One for Each Motor)			
DC	OFF	°C	120 ± 5	120 ± 5	120 ± 5
AC	OFF	°C	135 ± 5	135 ± 5	135 ± 5
	ON	°C	110~60	110~60	110~60
Control Circuit					
PCB1, 5 Fuse Capacity	A	5	5	5	
PCB3 Fuse Capacity	A	10	10	10	

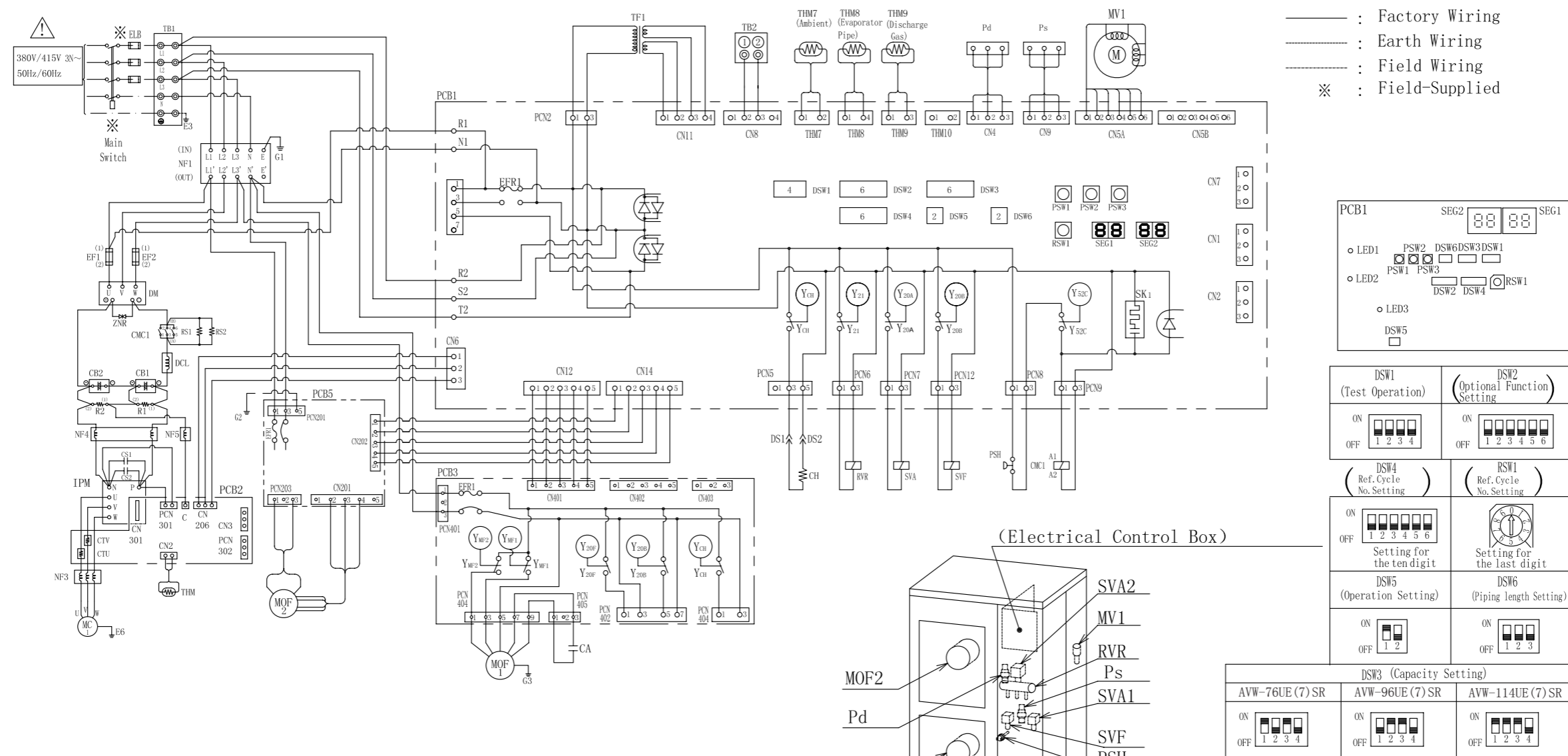
## Discharge Air Overheating Protection



10.7 Electrical Wiring Diagram

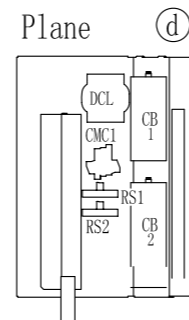
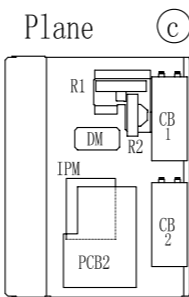
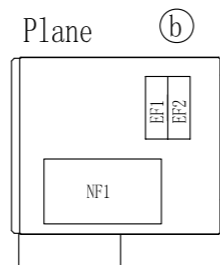
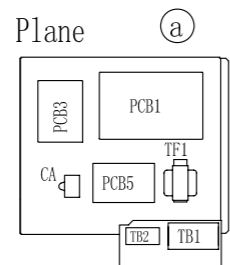
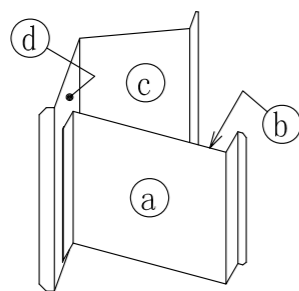
⚠ (ELECTRICAL WIRING DIAGRAM) FOR MODELS: AVW-76UE (7) SR AVW-96UE (7) SR AVW-114UE (7) SR

Turn OFF the main power switch to the indoor unit and the outdoor unit and wait for more than 1 minute before electrical wiring work or a periodical check is performed.



Electrical Wiring Between Indoor Unit and Outdoor Unit  
Do not connect the power source line to the terminals 1 and 2.  
These terminals are for the control line. If connected, the printed circuit board will be damaged.

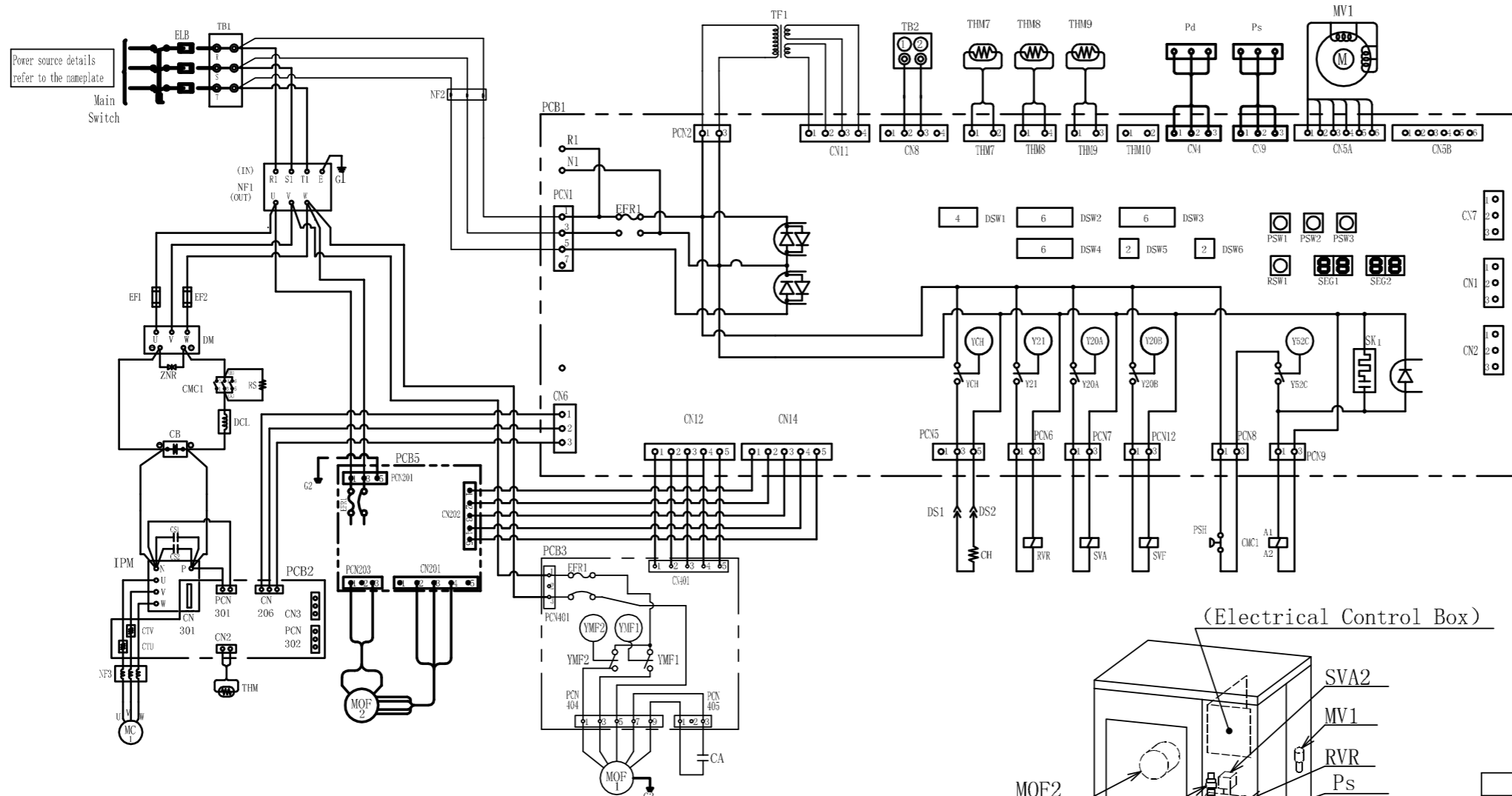
(Electrical Control Box)



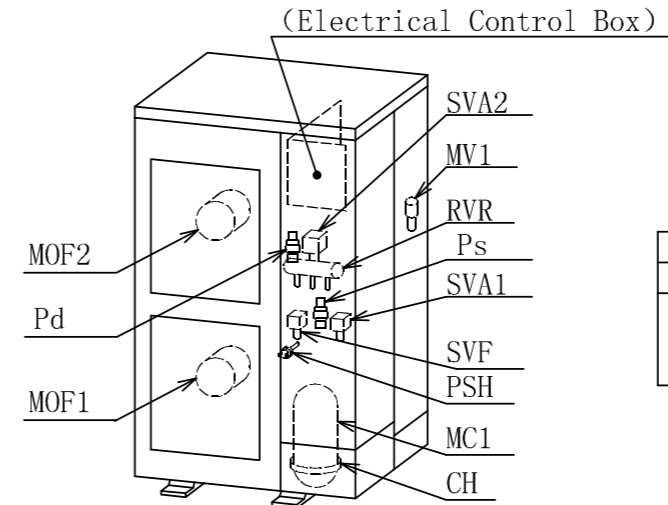
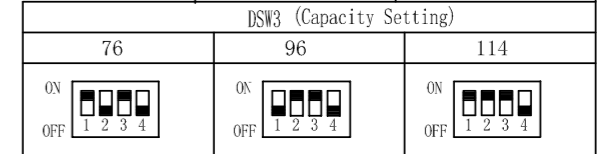
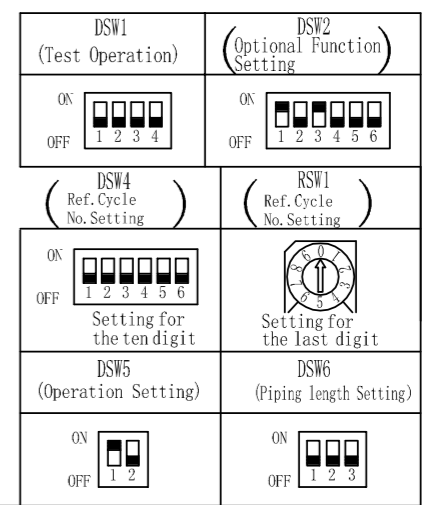
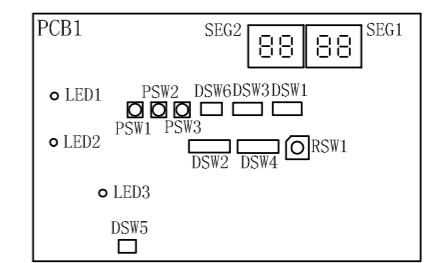
TB1, 2	(Terminal Board)
TF1	(Transformer)
THM	(Thermistor for FIN Temperature)
THM7~9	(Thermistor)
ZNR	(Surge Absorber)
CA	(Capacitor)
CS1, 2	(Capacitor)
CB1, 2	(Capacitor)
CH	(Crankcase Heater)
CMC1	(Contactor for Compressor Motor)
DCL	(Reactor)
DS1, 2	(I.F. Connector)
DM	(Diode Module)
DSW1, 6	(Dip Switch on PCB1)

MARK	NAME
IPM	(Inverter System Power Podule)
MC1	(Motor for Compressor)
MOF1, 2	(Motor for Out Fan)
MV1	(Micro-Computer Control Expansion Valve)
NF1~4	(Noise Filter)
PCB1~5	(Printed Circuit Board)
PSH	(High Pressure Switch For Protection)
Pd, s	(Sensor for Refrigerant Pressure)
PSW1~3	(Push Switch on PCB1)
RPR	(Reverse Phase Protection Relay)
RVR	(Reversing Valve Relay)
RS1, 2	(Resistor for Starting)
RI, 2	(Resistor)
SVA	(Solenoid Valve for Hot Gas Bypass)
SVF	(Solenoid Valve for Backing Of Oil)
EF1, 2	(Fuse)
SW1	(Switch)

Turn OFF the main power switch to the indoor unit and the outdoor unit and wait for more than 1 minute before electrical wiring work or a periodical check is performed.

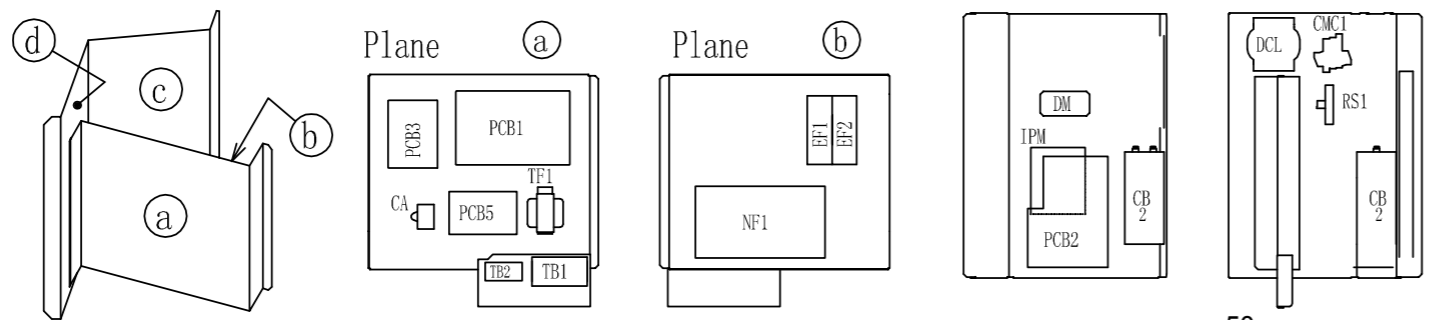


— : Factory Wiring  
 - - - : Earth Wiring  
 — : Field Wiring  
 ※ : Field-Supplied



Electrical Wiring Between Indoor Unit and Outdoor Unit  
 Do not connect the power source line to the terminals 1 and 2.  
 These terminals are for the control line. If connected, the printed circuit board will be damaged.

(Electrical Control Box)



TB1, 2	(Terminal Board)
TF1	(Transformer)
THM	(Thermistor for FIN Temperature)
THM7~9	(Thermistor)
ZNR	(Surge Absorber)
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R1, 2	(Resistor)
SVA	(Solenoid Valve for Hot Gas Bypass)
SVF	(Solenoid Valve for Backing Of Oil)
EF1, 2	(Fuse)
SW1	(Switch)

## 11. Refrigerant Piping System

### 11.1 Refrigerant Pipe

11.1.1 Allocate refrigerant pipes based on the table below

Table 11.1 Piping Size of Outdoor Unit

Piping Length Model	Outer Diameter (mm)		Max. Piping Length	Max.Height of O.U.and I.U.
	Gas Pipe ( *1 )	Liquid Pipe		
AVW-76UE(7)(9)SR	19.05	Φ 9.53 ( Φ 12.7 ( *2 ) )	Actual ≤ 100m Equivalent ≤ 125m	O.U.Higher: ≤ 50m O.U.Lower: ≤ 40m
AVW-96UE(7)(9)SR	22.2	Φ 12.7		
AVW-114UE(7)(9)SR	25.4			

( \*1 ) Pipe accessories are available before shipment at the factory.

( \*2 ) If the refrigerant piping is more than 70 meters, the liquid pipe must be Φ 12.7 (only for AVW-76UE(7)(9)SR )

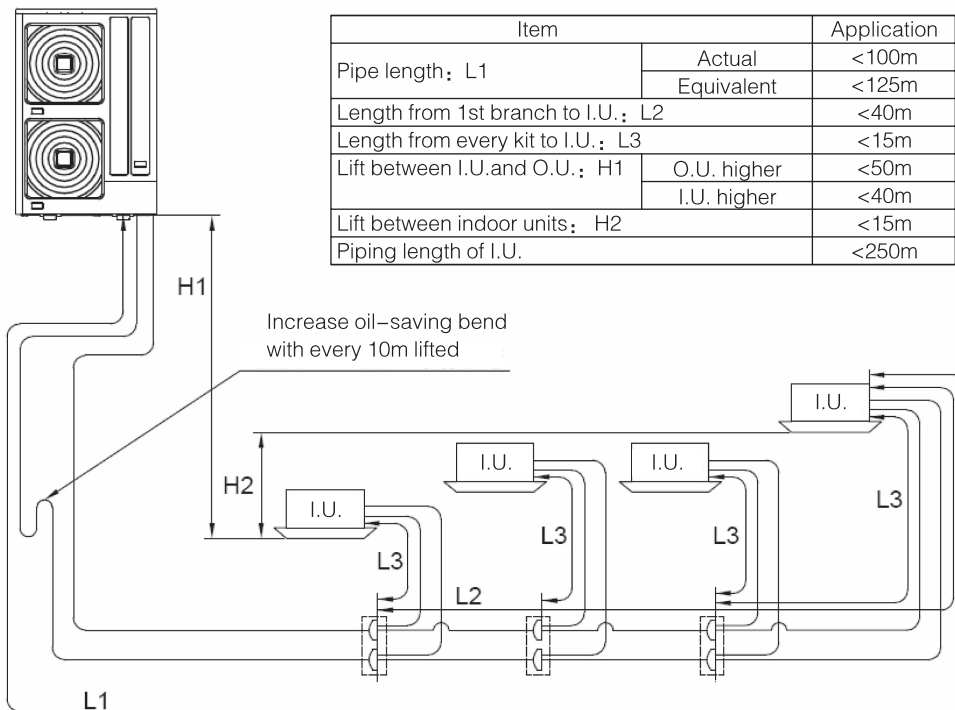


Table 11.2 Branch pipe

Branch pipe	HFQ-102F
Gas Line	
Liquid Line	
Branch pipe	HFQ-162F
Gas Line	
Liquid Line	

Unit: mm, ID: Inner Diameter, OD: Outer Diameter

## 11.2 Piping System



### I. Down-size piping system

(Pipes and branch pipes between outdoor unit to the 1st branch)

Equivalent piping length	AVW-76UE(7)(9)SR		AVW-96UE(7)(9)SR		AVW-114UE(7)(9)SR	
	Gas/liquid pipe (Φmm)	1st branch pipe	Gas/liquid pipe (Φmm)	1st branch pipe	Gas/liquid pipe (Φmm)	1st branch pipe
< 70m	19.05/9.53	HFQ-102F	22.2/12.7	HFQ-102F	25.4/12.7	HFQ-162F
≥ 70m	19.05/12.7					

(From the first to the last branch pipe)

I.U. capacity ( kW )		Q < 16.8	16.8 ≤ Q < 25.2	25.2 ≤ Q < 36.4	36.4 ≤ Q < 45.0
Diameter	Gas ( Φmm )	15.88	19.05	22.2	25.4
	Liquid ( Φmm )	9.53	9.53	9.53	12.7
Branch pipe		HFQ-102F	HFQ-102F	HFQ-102F	HFQ-162F

Note: the pipes (gas and liquid) behind the first branch pipe is bigger than the pipe of the first branch pipe, select the later.

(From the last branch pipe to indoor unit)

I.U. model	Pipe size ( Φmm )			Remark
	Gas Pipe	Liquid Pipe		
Type 22~45	12.7	6.35		
Type 50~56	15.88	6.35		
Type 63~160	15.88	9.53		Liquid pipe size of AVS-22URC(2)SRAA is 6.35
Type 224	19.05	9.53		
Type 280	22.2	9.53		

### II. Uni-size piping system

(Pipes and branch pipes between O.U. and branches)

Equivalent length	AVW-76UE(7)(9)SR		AVW-96UE(7)(9)SR		AVW-114UE(7)(9)SR	
	Gas/liquid ( Φmm )	Branch pipe	Gas/liquid ( Φmm )	Branch pipe	Gas/liquid ( Φmm )	Branch pipe
< 70m	19.05/9.53	HFQ-102F	22.2/12.7	E-102SN	25.4/12.7	HFQ-162F
≥ 70m	19.05/12.7					

Note: uni - size piping system refers to that all pipes, including the pipes between O.U. and the first branch pipe and the pipes between branch pipes, are same in size, and the all branch pipes are of the same type. The pipes (gas and liquid) between branch pipe and I.U. are same as Down-size piping system.

### 11.3 Additional Refrigerant Charge

#### Additional refrigerant R410A charging

Though the refrigerant in the unit, additional refrigerant must be charged based on piping length.

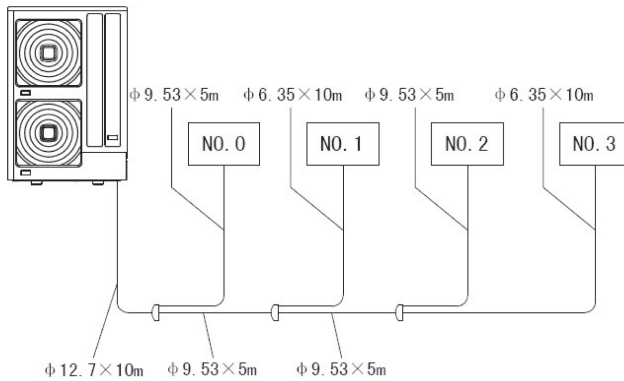
A: Determine added weight as below and charge it in the system.

B. Added refrigerant weight should be reported to local service center.

#### 1. Calculation method of additional refrigerant charge(W kg)

<Example>

AVW-114UE(7)(9)SR



<Table 1> ( kg )

Outdoor Unit	W0: Charge in O.U.
AVW-76UE(7)(9)SR	5.0
AVW-96UE(7)(9)SR	5.5
AVW-114UE(7)(9)SR	5.5

Note:

W0 is the original charge at the factory.

Take AVW-114UE(7)(9)SR for example, and fill in the following table

Pipe diameter(mm)	Total length(m)	Additional charge(kg)
Φ 12.7....	(10)	× 0.12 = 1.2
Φ 9.53....	(5+5+5+5)	× 0.07 = 1.4
Φ 6.35....	(10+10)	× 0.03 = 0.6

Total Tiping Length 50m Additional Charge W=3.2(kg)



**CAUTION**

**Max.Ref.Charge: 13.5kg**

**Contact the vendor when it is more than 13.5kg**

Pipe diameter(mm)	Total length(m)	Additional charge(kg)
Φ 12.7....	<input type="text"/>	× 0.12 = <input type="text"/>
Φ 9.53....	<input type="text"/>	× 0.07 = <input type="text"/>
Φ 6.35....	<input type="text"/>	× 0.03 = <input type="text"/>

Total Tiping Length m Additional Charge W=(kg)

#### 2. Operation

Charge refrigerant R410A into system as follows

(1) Connect charging hose to multi-functional measuring gauge and charging tank to checking coupling of stop valve (liquid).

(2) Open thoroughly stop valve (gas), open slowly the stop valve (liquid); turn on the valve of measuring and charge refrigerant.

(3) Run cooling operation, charge determined refrigerant by weighing with electric scale or others. Too much or shortage would cause problems for the units.

Open thoroughly liquid valve after charging.

#### 3. Record the weight charged

Additional charge should be recorded for service and maintenance

Calculate total refrigerant in the system as follows

$$\text{Total weight} = W + W_0$$

$$\text{System} = \text{} + \text{$$

Total additional charge W  kg  
 Total refrigerant in system  kg  
 Charging date  
 y  m  d

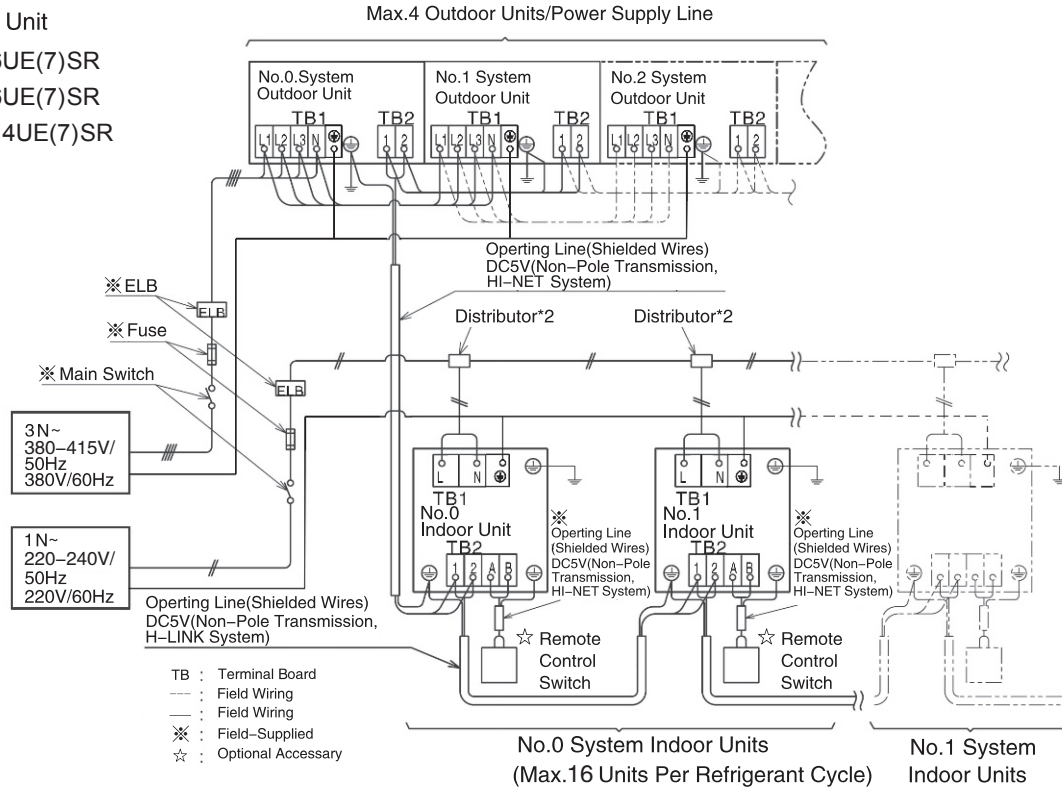
## 12. Field Wiring Provisions

### Electrical Wiring

All the field wiring and equipment must comply with local codes.

### Electrical Wiring Example

Outdoor Unit  
 AVW-76UE(7)SR  
 AVW-96UE(7)SR  
 AVW-114UE(7)SR



o

Outdoor Unit  
 AVW-76U9SR  
 AVW-96U9SR  
 AVW-114U9SR

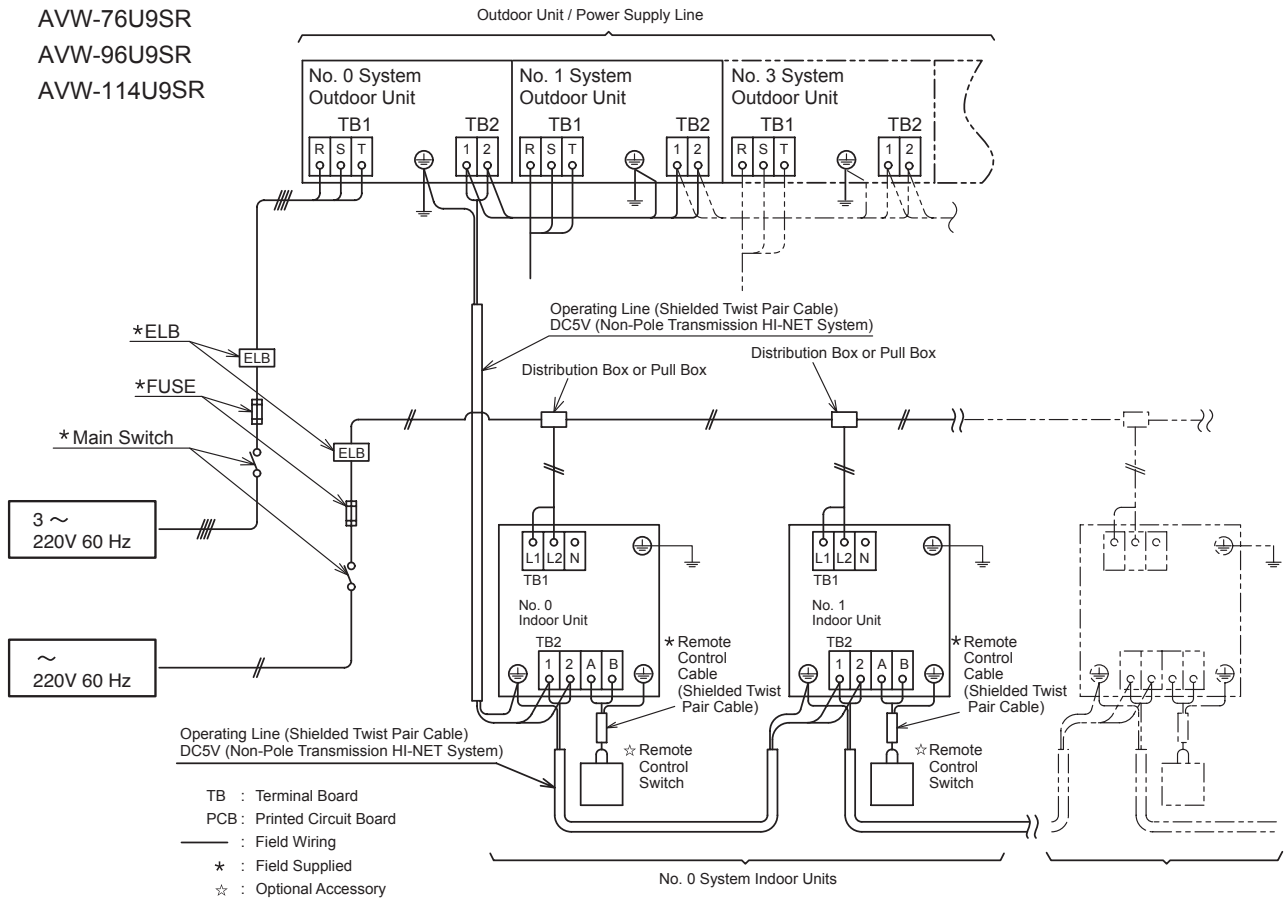


Table for Terminal Connection

O.U.: Outdoor Unit, I.U.: Indoor Unit

Wiring	[ Connection (Connection of Terminals) ]
Power Supply	[ O.U.-O.U. (L1-L1, L2-L2, L3-L3, N-N) ]
	[ I.U.-I.U. (L-L, N-N) ]
Operating	[ O.U.-I.U., I.U.-I.U. (1-1, 2-2) ]

# **Installation and Operation**

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## 1. Safety Summary

### **! WARNING**

- Do not install the cooling pipes, draining pipes and wirings before reading this manual.
- Check that the ground wire is securely connected.
- Connect a fuse of specified capacity.

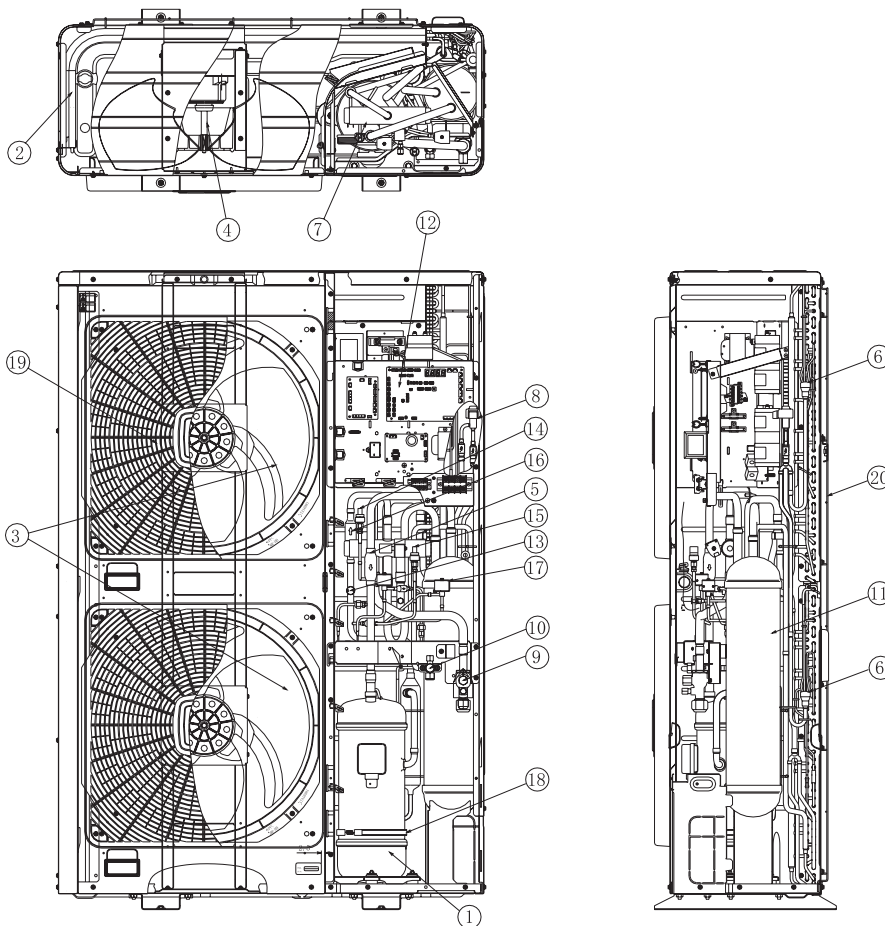
### **! DANGER**

Do not install the indoor and outdoor unit, remote control and cables within approximately 3 meters from strong electromagnetic sources such as medical equipment.

## 2. Structure

### 2.1 Outdoor Unit and Refrigerant Cycle

<Outdoor unit>

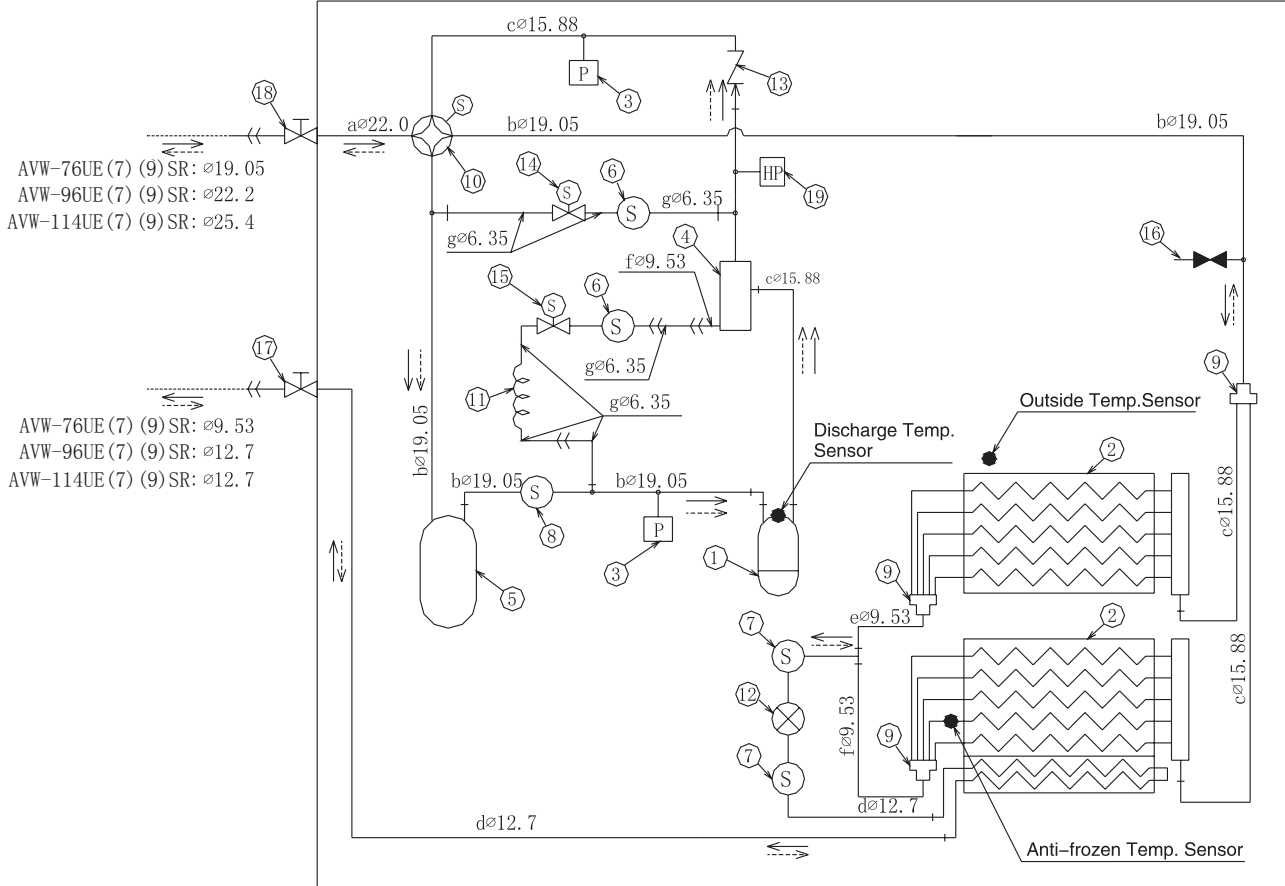


No.	Part Name	No.	Part Name
1	Compressor	11	Accumulator
2	Heat Exchanger	12	Electrical Box
3	Propeller Fan	13	High Pressure Protection Switch
4	Fan Motor	14	High Pressure Sensor
5	Strainer	15	Low Pressure Sensor
6	Divertor	16	Check Valve
7	Reversing Valve	17	Solenoid Valve
8	Expansion Valve	18	Crankcase Heater
9	Stop Valve (Gas)	19	Air Outlet
10	Stop Valve (Liquid)	20	Air Inlet



<Refrigerant Cycle>

Outdoor Unit



- ← : Refrigerant Flow Direction(Cooling)
- ←← : Refrigerant Flow Direction(Heating)
- : Field Refrigerant Piping
- ) : Flare Connection
- + : Brazing Connection
- +| : Flange Connection

Mark	Part Name
(1)	Compressor
(2)	Heat Exchanger
(3)	Pressure Sensor
(4)	Oil Separator
(5)	Accumulator
(6)	Strainer(3/8)
(7)	Strainer(1/2)
(8)	Strainer(3/4)
(9)	Diverter
(10)	4-Way Valve
(11)	Capillary Tube
(12)	Electrical Expansion Valve
(13)	Check Valve
(14)	By-pass Solenoid Valve
(15)	Solenoid Valve for Oil Return
(16)	Check Joint
(17)	Stop Valve-liquid
(18)	Stop Valve-gas
(19)	Pressure Switch

Mark	ODxT	Material
a	$\Phi 22.0 \times 1.5T$	C1220T-0
b	$\Phi 19.05 \times 1.65T$	
c	$\Phi 15.88 \times 1.2T$	
d	$\Phi 12.7 \times 1.0T$	
e	$\Phi 9.53 \times 1.2T$	
f	$\Phi 9.53 \times 0.8T$	
g	$\Phi 6.53 \times 1.07T$	

## 2.2 Necessary Tools and Instrument List for Installation

No.	Tool	No.	Tool	No.	Tool	No.	Tool
1	Handsaw	6	Copper Pipe Bender	11	Spanner	16	Leveller
2	Screwdriver	7	Manual Water Pump	12	Charging Cylinder	17	Clamper for Solderless Terminals
3	Vacuum Pump	8	Pipe Cutter	13	Gauge Manifold	18	Hoist (for Indoor Unit)
4	Refrigerant Gas Hose	9	Brazing Kit	14	Cutter for Wires	19	Ammeter
5	Megohmmeter	10	Hexagon Wrench	15	Gas Leak Detector	20	Voltage Meter

Use tools and measuring instruments only for the new refrigerant which is directly touch to refrigerant.

◇: Interchangeability is available with current R22  
 X: Prohibited

●: only for Refrigerant R410A (No Interchangeability with R22)  
 ◆: only for Refrigerant R407C (No Interchangeability with R22)

Measuring Instrument and Tool		Interchangeability with R22		Reason of Non-Interchangeability and Attention (★: Strictly Required)	Use
		R410A	R407C		
Refrigerant Pipe	Pipe Cutter Chamfering Reamer	◇	◇	-	Cutting Pipe Removing Burrs
	Flaring Tool	◇●	◇	* The flaring tools for R407C are applicable to R22. * If using flaring tube, make dimension of tube larger for R410A. * In case of material 1/2H, flaring is not available.	Flaring for Tubes Dimensional Control for Extruded Portion of Tube after Flaring
	Extrusion Adjustment Gauge	●	-		
	Pipe Bender	◇	◇	* In case of material 1/2H, bending is not available. Use elbow for bend and braze.	Bending
	Expanding Tool	◇	◇	* In case of material 1/2H, expanding of tube is not available. Use socket for connecting tube.	Expanding Tubes
	Torque Wrench	●	◇	* For φ12.7, φ15.88, spanner size is up 2mm. * For φ6.35, φ9.53, φ19.05, spanner size is the same.	Connection of Flare Nut
	Brazing Tool	◇	◇	* Perform correct brazing work.	Brazing for Tubes
	Nitrogen Gas	◇	◇	* Strict Control against Contamin (Blow nitrogen during brazing.)	Prevention from Oxidation during Brazing
	Lubrication Oil (for Flare Surface)	●	◆	* Use a synthetic oil which is equivalent to the oil used in the refrigeration cycle. * Synthetic oil absorbs moisture quickly.	Applying Oil to the Flared Surface
Vacuum Drying Refrigerant Charge	Refrigerant Cylinder	●	◆	* Check refrigerant cylinder color. ★ Liquid refrigerant charging is required regarding zeotropic refrigerant.	Refrigerant Charging
	Vacuum Pump	◇	◇	★ The current ones are applicable. However, it is required to mount a vacuum pump adapter which can prevent from reverse flow when a vacuum pump stops, resulting in no reverse oil flow.	Vacuum Pumping
	Adapter for Vacuum Pump	*●	◆		
	Manifold Valve	●	◆	* No interchangeability is available due to higher pressures when compared with R22. ★ Do not use current ones to the different refrigerant. If used, mineral oil will flow into the cycle and cause sludges, resulting in clogging or compressor failure. Connection diameter is different; R410A: UNF1/2, R407C: UNF7/16.	Vacuum Pumping, Vacuum Holding, Refrigerant Charging and Check of Pressures
	Charging Hose	●	◆		
	Charging Cylinder	X	X	* Use the weight scale.	-
	Weight Scale	◇	◇	-	Measuring Instrument for Refrigerant Charging
Refrigerant Gas Leakage Detector	*●	◆	* The current gas leakage detector (R22) is not applicable due to different detecting method.	Gas Leakage Check	

\*: Interchangeability with R407C.

### 3. Transportation and Handling

#### 3.1 Transportation

Transport the product as close to the installation location as practical before unpacking.

## ! CAUTION

**Do not put any material on the product. Apply two lifting wires onto the outdoor unit, when lifting it by crane.**

● **Hanging Method**

When hanging the unit, ensure a balance of the unit, check safety and lift up smoothly.

- (1) Do not remove any packing materials.
- (2) Hang the unit under packing condition with two (2) ropes, as shown in Fig. 3.1.

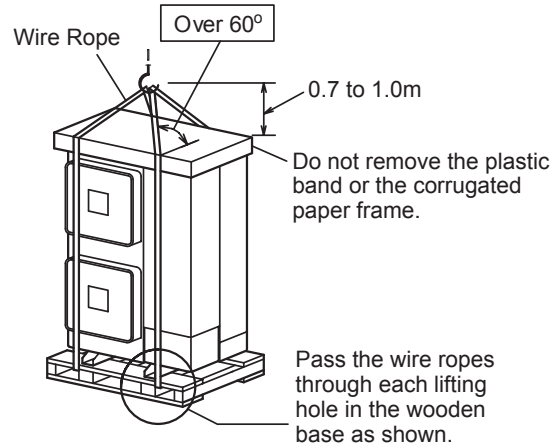


Fig. 3.1 Hanging Work for Transportation

## ! CAUTION

- Lift the outdoor unit in its factory packaging with 2 wire ropes.
- For safety reasons ensure that the outdoor unit is lifted smoothly and does not lean.
- Do not attach lifting equipment to the plastic band or the corrugated paper frame.
- Ensure the exterior of the unit is adequately protected with cloth or paper.

#### 3.2 Handling of Outdoor Unit

## ! WARNING

**Do not put any foreign material into the outdoor unit and check to ensure that none exists in the outdoor unit before the installation and test run. Otherwise, a fire or failure, etc. may occur.**

● **When Using Handles**

When manually lifting the unit using the handles, pay attention to the following points.

- (1) Do not remove the wooden base from outdoor unit.
- (2) To prevent the unit from overturning, pay attention to the center of gravity as shown in the below figure.
- (3) Two or more personnel should be used to move the unit.

Model	Unit Gross Weight (kg)
AVW-76UE(7)(9)SR	179
AVW-96UE(7)(9)SR	179
AVW-114UE(7)(9)SR	182

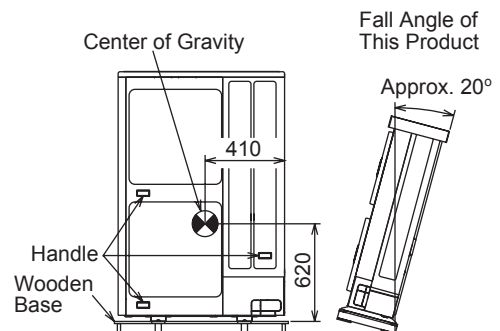


Fig. 3.2 Handling of Outdoor Unit

## 4. Outdoor Unit Installation

### 4.1 Factory-Supplied Accessories

Check to ensure that the following accessories are packed with the outdoor unit.

Table 4.1 Factory-Supplied Accessories

Accessory	Q'ty
Pipe with Flange of Refrigerant Piping	1
Compressed Sheet	1

---

### NOTE

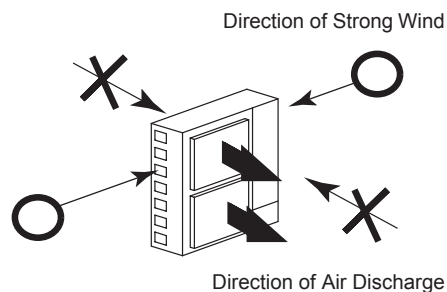
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If any of these accessories are not packed with the unit, please contact your contractor.

---

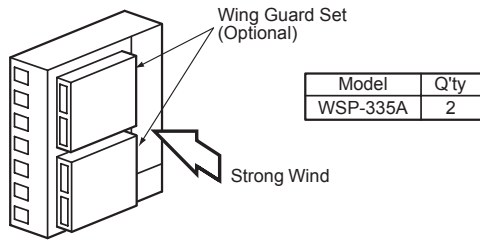
### 4.2 Initial Check

- Install the outdoor unit where good ventilation is available, and where it is dry.
- Install the outdoor unit where the sound or the discharge air from the outdoor unit does not affect neighbors or surrounding vegetation. The operating sound at the rear or right/left sides is higher than the value in the catalog at the front side.
- Check to ensure that the foundation is flat, level and sufficiently strong.
- Do not install the outdoor unit where there is a high level of oil mist, salty air or harmful gases such as sulphur.
- Do not install the outdoor unit where the electromagnetic wave is directly radiated to the electrical box.
- Install the outdoor unit as far as practical, being at least 3 meters from the electromagnetic wave radiator.
- When installing the outdoor unit in snow-covered areas, mount the field-supplied hoods at the discharge side of the outdoor unit and the inlet side of the heat exchanger.
- Install the outdoor unit where it is in the shade or it will not be exposed to direct sunshine or direct radiation from high temperature heat source.
- Do not install the outdoor unit where dust or other contamination could block the outdoor heat exchanger.
- Install the outdoor unit in a space with limited access to general public.
- Do not install the outdoor unit in a space where a seasonal wind directly blows to the outdoor heat exchanger or a wind from a building space directly blows to the outdoor fan.

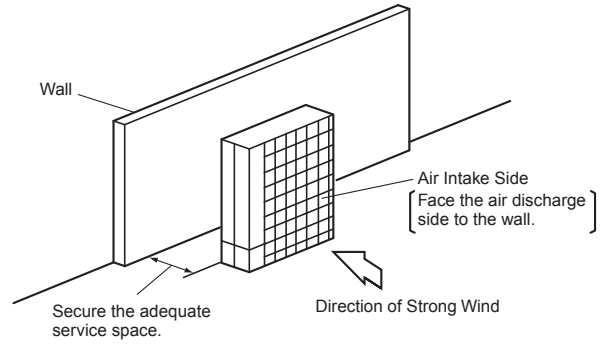


- In case of installation in the open spaces unavoidably where there is no buildings or surrounding structures, adopt the wind guard set or install near the wall to avoid facing the wind directly. Ensure that the service space should be secured.

(1) Using Wind Guard



(2) A Wall to Guard Against Wind



**NOTE:**

If the extreme strong wind blows directly against the air discharge portion, the fan may rotate reversely and be damaged.

**CAUTION**

Aluminum fins have very sharp edges. Pay attention to the fins to avoid any injury.

**NOTE**

Install the outdoor unit on a roof or in an area where people except service engineers can not touch the outdoor unit.

**4.3 Service Space**

Install the outdoor unit with a sufficient space around the outdoor unit for operation and maintenance as shown below.

(1) Obstacles on Inlet Side

(a) Upper Side is Open.

(mm)

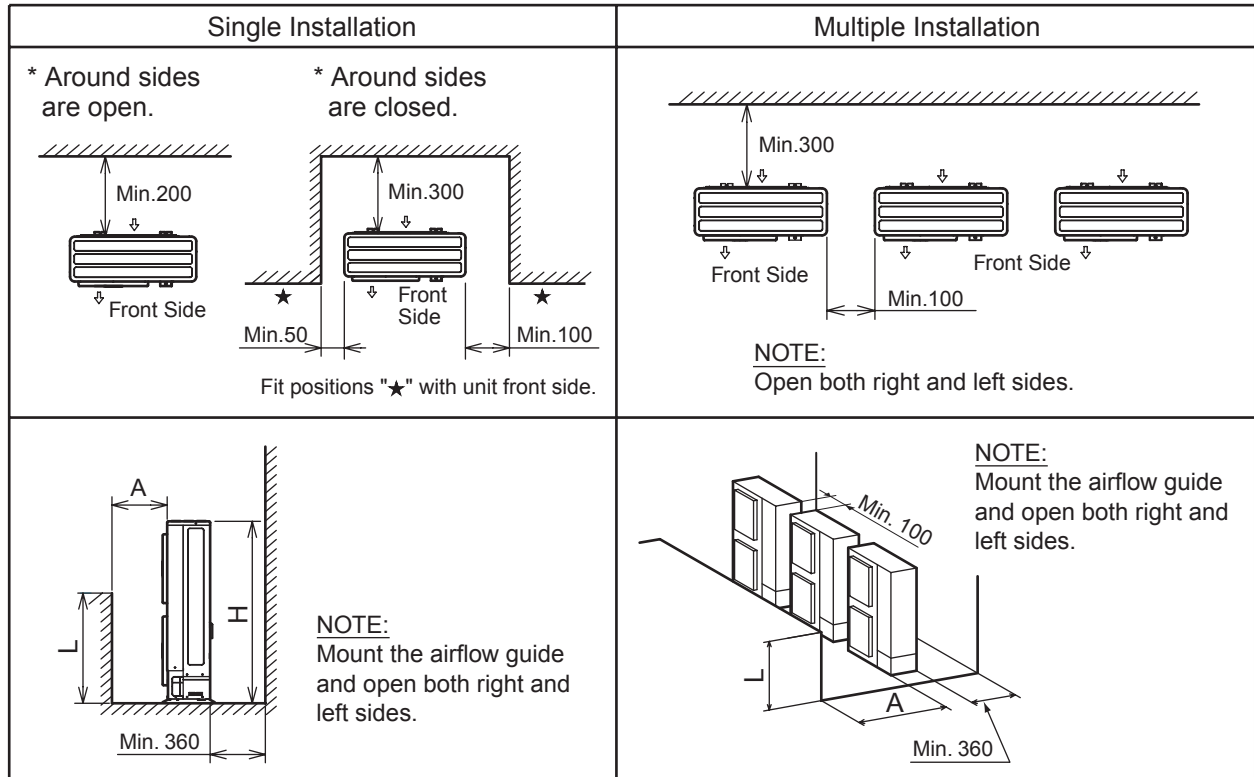


Fig. 4.1 Installation Space (1)

(b) Obstacles in Above

(mm)

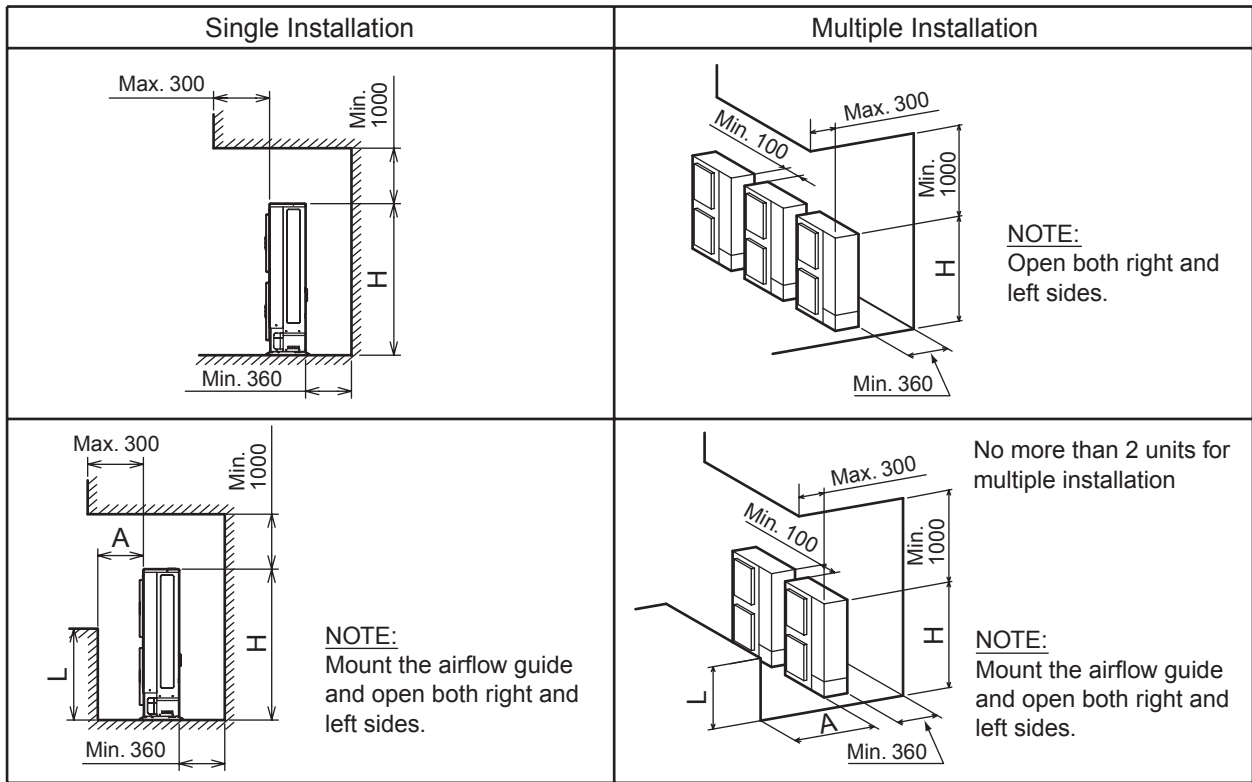


Fig. 4.2 Installation Space (2)

(2) Obstacles on Discharge Side

(a) Upper Side is Open.

(mm)

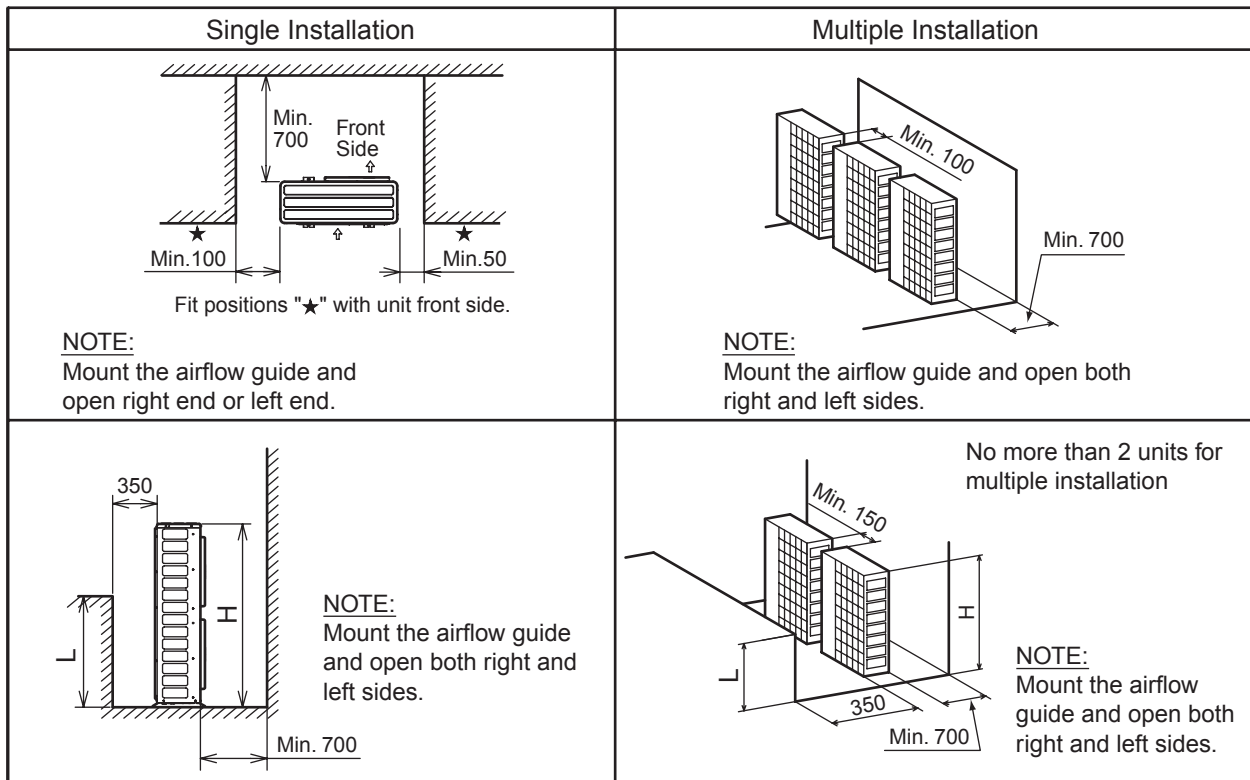
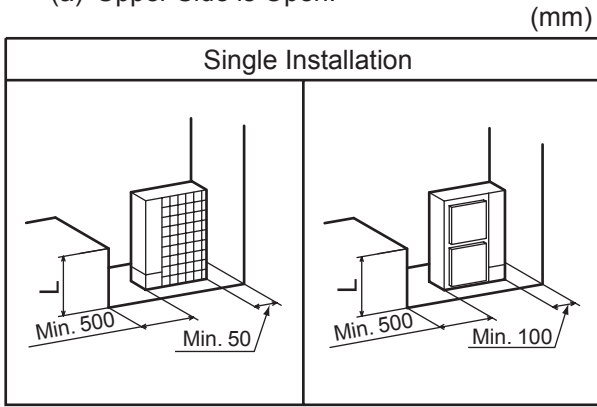


Fig. 4.3 Installation Space (3)

(3) Obstacles in Right and Left

(a) Upper Side is Open.



(b) Obstacles in Above

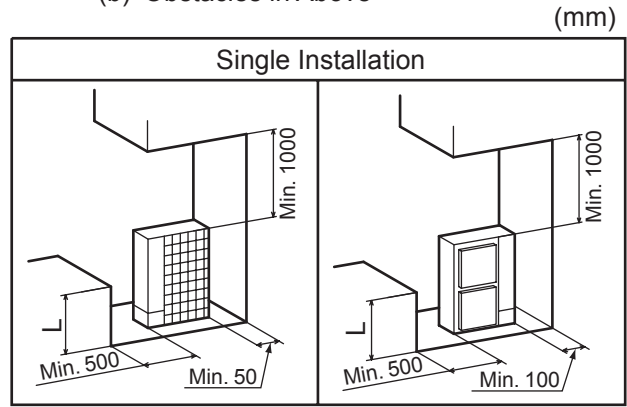


Fig. 4.4 Installation Space (4)

**NOTE**

If L is larger than H, mount the units on a base so that H is greater or equal to L.

H: Unit Height (1650mm) + Base Concrete Height

L	A
$0 < L \leq 1/2H$	600 or more
$1/2H < L \leq H$	1400 or more

In this situation ensure that the base is closed and does not allow the airflow to short circuit. In each case, install the outdoor unit so that the discharge flow is not short-circuited.

(4) Multi-Row and Multiple Installations

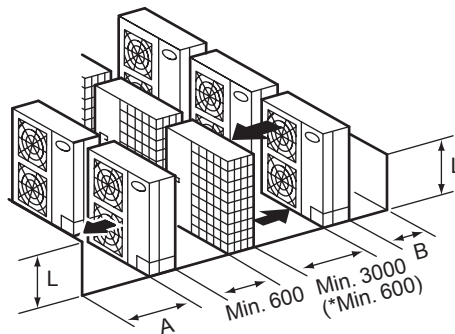


Fig. 4.5 Installation Space (5)

Keep a distance of more than 15mm between other units and do not put obstacles on the right and left sides. Dimension B is as shown below.

L	A	B
$0 < L \leq 1/2H$	600 or more	300 or more
$1/2H < L \leq H$	1400 or more	350 or more

**NOTE:**

If L is larger than H, mount the units on a base so that H is greater or equal to L. In this situation ensure that the base is closed and does not allow the airflow to short circuit. When the mark \* dimension is secured, be sure to mount the airflow guide.

### 4.4 Installation Work

- (1) Secure the outdoor unit with the anchor bolts.

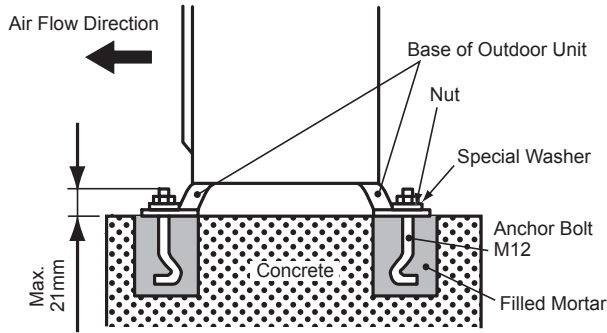
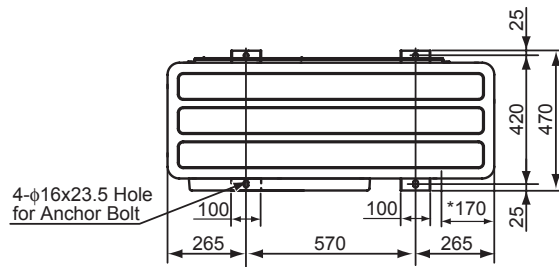


Fig. 4.6 Installation of Anchor Bolts

Fix the outdoor unit to the anchor bolts by special washer of factory-supplied accessory.

- (2) When installing the outdoor unit, fix the unit by anchor bolts. Refer to Fig. 4.7 regarding the location of fixing holes.



**NOTE:**

When the mark \* dimension is secured, piping work from bottom side is easy without interference of foundation.

Fig. 4.7 Position of Anchor Bolts

- (3) Example of fixing outdoor unit by anchor bolts.

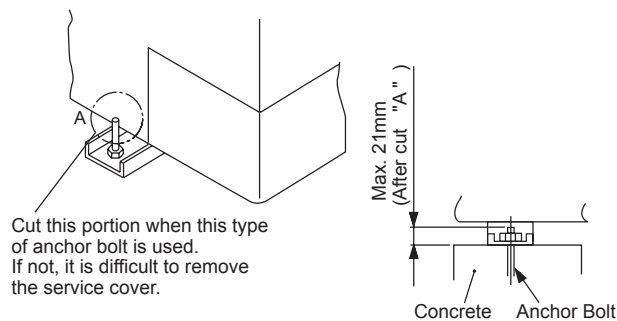


Fig. 4.8 Fixing Example



- (4) Fix the outdoor unit firmly so that declining, making noise, and falling down by strong wind or earthquake is avoided.

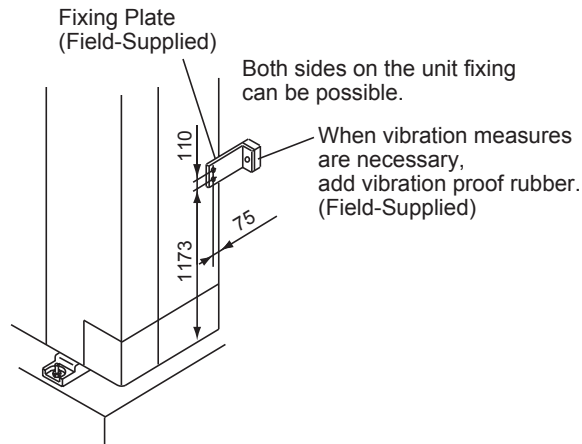
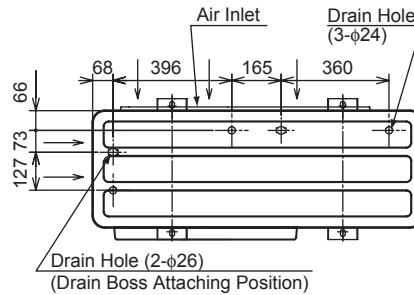
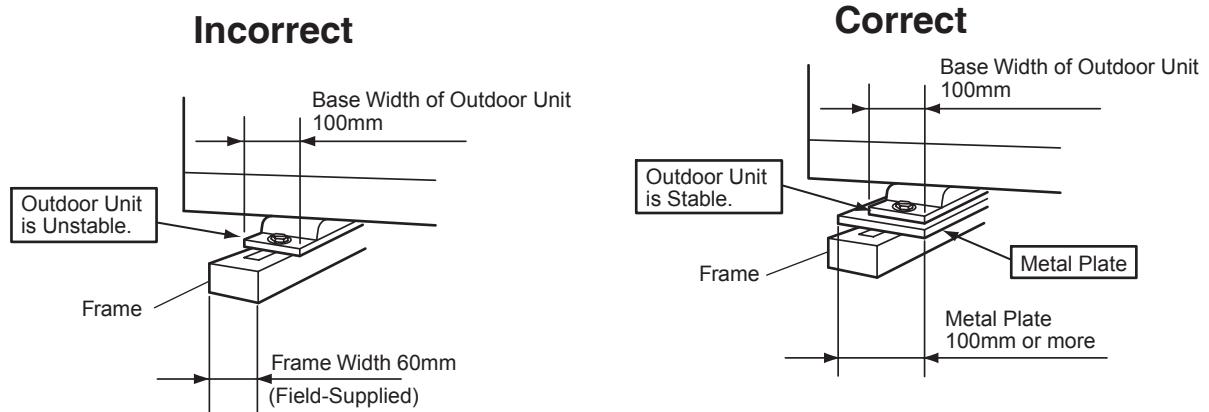


Fig. 4.9 Additional Fixing Arrangement

- (5) When installing the unit on a roof or a veranda, drain water sometimes turns to ice in a cold morning. Therefore, avoid draining in an area where people often use because it is slippery.
- (6) In case of the drain piping is necessary for the outdoor unit, use the drain-kit (DC-01Q: Optional Parts).



- (7) The whole of the base of the outdoor unit should be installed on a foundation. When using vibration-proof mat, it should also be positioned the same way. When installing the outdoor unit on a field-supplied frame, use metal plates to adjust the frame width for stable installation as shown in Fig. 4.10.



Recommended Metal Plate Size (Field-Supplied)

Material: Hot-Rolled Mild Steel Plate (SPHC) Plate Thickness: 4.5T

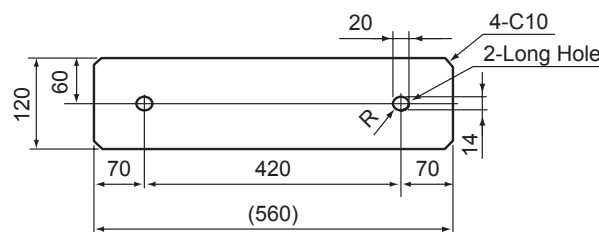


Fig. 4.10 Frame and Base Installation

## 5. Refrigerant Piping Work

# ⚠ DANGER

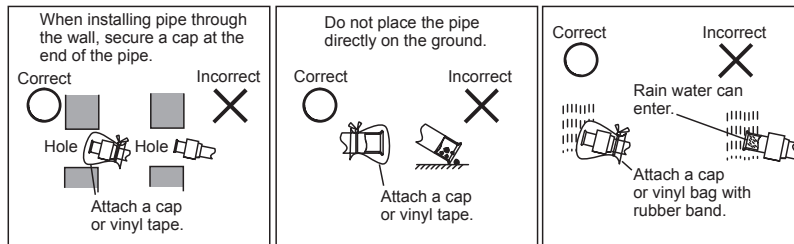
Use refrigerant R410A in the refrigerant cycle. Do not charge oxygen, acetylene or other flammable and poisonous gases into the refrigerant cycle when performing a leakage test or an air-tight test. These types of gases are extremely dangerous and can cause an explosion. It is recommended that compressed air, nitrogen or refrigerant be used for these types of tests.

### 5.1 Piping Materials

- (1) Prepare locally-supplied copper pipes.
- (2) Select the piping size from the Table 5.1.
- (3) Select clean copper pipes. Make sure there is no dust and moisture inside of the pipes. Blow the inside of the pipes with nitrogen or dry air, to remove any dust or foreign materials before connecting pipes.

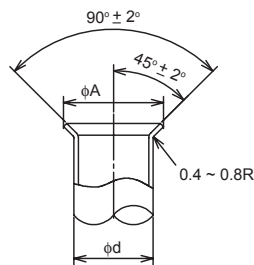
### NOTE

#### ● Cautions for Refrigerant Pipe Ends



#### ● Flaring Dimension

Perform the flaring work as shown below.



Diameter φd	(mm)	
	A	+0 -0.4
6.35	9.1	R410A
9.53	13.2	
12.7	16.6	
15.88	19.7	
19.05	(*)	

(\*) It is impossible to perform the flaring work with 1/2H material. In this case, use an accessory pipe (with a flare).

#### ● Piping Thickness and Material

Use the pipe as below.

Diameter	(mm)	
	R410A	
	Thickness	Material
φ6.35	0.8	O material
φ9.53	0.8	O material
φ12.7	0.8	O material
φ15.88	1.0	O material
φ19.05	1.0	1/2H material
φ22.2	1.0	1/2H material
φ25.4	1.0	1/2H material
φ28.6	1.0	1/2H material

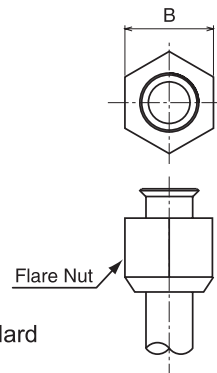
Material is based on a JIS standard (JIS B8607).

- Flare Nut Dimension  
Use the flare nut as below.

<Flare Nut Dimension B (mm)

Diameter	R410A
φ6.35	17
φ9.53	22
φ12.7	26
φ15.88	29
φ19.05	36

Dimension is based on a JIS standard (JIS B8607).



## ⚠ CAUTION

- Cap the end of the pipe when the pipe is to be inserted through a hole.
- Do not put pipes on the ground directly without a cap or vinyl tape at the end of the pipe.

- Combination between Indoor Unit and Outdoor Unit

Table 5.1 Indoor Unit Type List

Indoor Unit Type	Nominal Horsepower (kBTu/h)										
	07	09	14	18	24	27	30	38	48	76	96
Ceiling Ducted Type	○	○	○	○	○	○	○	○	○	○	○
Low-Height Duct Type	○	○	○	○	○						
4-Way Cassette		○	○	○	○	○	○	○	○		
2-Way Cassette		○	○	○	○	○		○	○		
Wall-Mounted Type		○	○	○	○22						
Floor		○	○								
Floor Concealed		○	○								
Ceiling Type				○	○	○	○	○	○		

○: Available

- A maximum total capacity of 130% and a minimum total capacity of 50% can be obtained by combination of the indoor units when compared with the nominal outdoor unit capacity.

Table 5.2 System Combination

Outdoor Unit Model	Indoor Unit			
	Min. Combination Capacity (HP)	Max. Combination Capacity (HP)	Combination Quantity	Minimum Individual Operation Capacity (HP)
AVW-76UE(7)(9)SR	4.0	10.4	1 ( *1 ) ~10	0.8
AVW-96UE(7)(9)SR	5.0	13.0	1 ( *1 ) ~10	0.8
AVW-114UE(7)(9)SR	6.0	15.6	1 ( *1 ) ~10	0.8

(\*1) A total capacity of 100% must be obtained by combination of the indoor units when compared with the nominal outdoor unit capacity, if only one indoor unit is combined.

## 5.2 Refrigerant Piping Work

(1) Ensure that the directions for refrigerant piping work according to the tables.

Table 5.3 Limitation of Outdoor Unit

Model	Outer Diameter and Piping Size (mm)		Maximum Piping Length	Maximum Lift between Outdoor Unit and Indoor Unit
	Gas (*1)	Liquid		
AVW-76UE(7)(9)SR	19.05	$\phi 9.53$ ( $\phi 12.7$ (*2))	Actual Length $\leq 100\text{m}$ Equivalent Length $\leq 125\text{m}$	Outdoor Unit is higher than Indoor Unit: $\leq 50\text{m}$ Indoor Unit is higher than Outdoor Unit: $\leq 40\text{m}$
AVW-96UE(7)(9)SR	22.2	$\phi 12.7$		
AVW-114UE(7)(9)SR	25.4			

(\*1): The accessory pipe with flange is attached.

(\*2): Select the liquid piping size of  $\phi 12.7$  when the piping length is more than 70m. only for RAS-8FSNM(Q)

Table 5.4 Branch Pipe for Line Branch

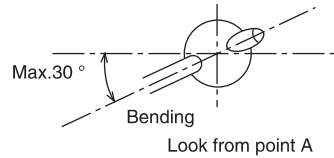
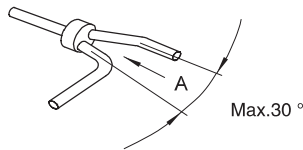
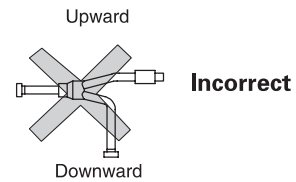
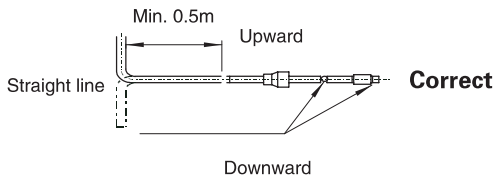
Branch Pipe	HFQ-102F	
Gas Line	<p>Diagram showing a gas line branch pipe for HFQ-102F. The main pipe has an ID of 22.2. Branches have IDs of 19.05, 15.88, 12.7, 15.88, 19.05, and 22.2. Pipe sizes include <math>\phi 25.4 \times 1.2\text{t}</math>, <math>\phi 19.05 \times 1.65\text{t}</math>, and <math>\phi 22.2 \times 1.5\text{t}</math>.</p>	
Liquid Line	<p>Diagram showing a liquid line branch pipe for HFQ-102F. The main pipe has an ID of 9.53. Branches have IDs of 12.7, 6.35, 9.53, and 6.35. Pipe sizes include <math>\phi 12.7 \times 1.0\text{t}</math> and <math>\phi 9.53 \times 1.0\text{t}</math>. A detail view shows a pipe with ID 9.53 and OD 6.35. Quantity: 2.</p>	
Branch Pipe	HFQ-162F	
Gas Line	<p>Diagram showing a gas line branch pipe for HFQ-162F. The main pipe has an ID of 25.4. Branches have IDs of 28.6, 22.2, 19.05, 15.88, 12.7, and 25.4. Pipe sizes include <math>\phi 22.22 \times 1.5\text{t}</math> and <math>\phi 25.4 \times 1.2\text{t}</math>. A detail view shows a pipe with ID 25.4, OD 28.6, and ID 15.88. Other pipe sizes shown are <math>\phi 28.6 \times 1.2\text{t}</math>, ID 12.7, ID 19.05, and ID 22.2.</p>	
Liquid Line	<p>Diagram showing a liquid line branch pipe for HFQ-162F. The main pipe has an ID of 12.7. Branches have IDs of 9.53, 12.7, 9.53, 6.35, and 12.7. Pipe sizes include <math>\phi 12.7 \times 1.0\text{t}</math> and <math>\phi 9.53 \times 1.0\text{t}</math>. A detail view shows a pipe with ID 9.53 and OD 6.35.</p>	

Unit: mm, ID: Inner Diameter, OD: Outer Diameter

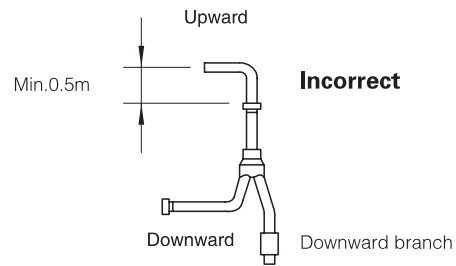
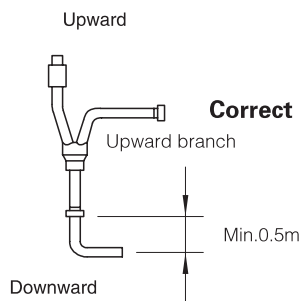
## (2) Branch pipe Installation

### ① Horizontal Installation

- All branch pipes are installed on a same level.
- After bending pipes vertically, the straight pipe is at least 0.5m long.



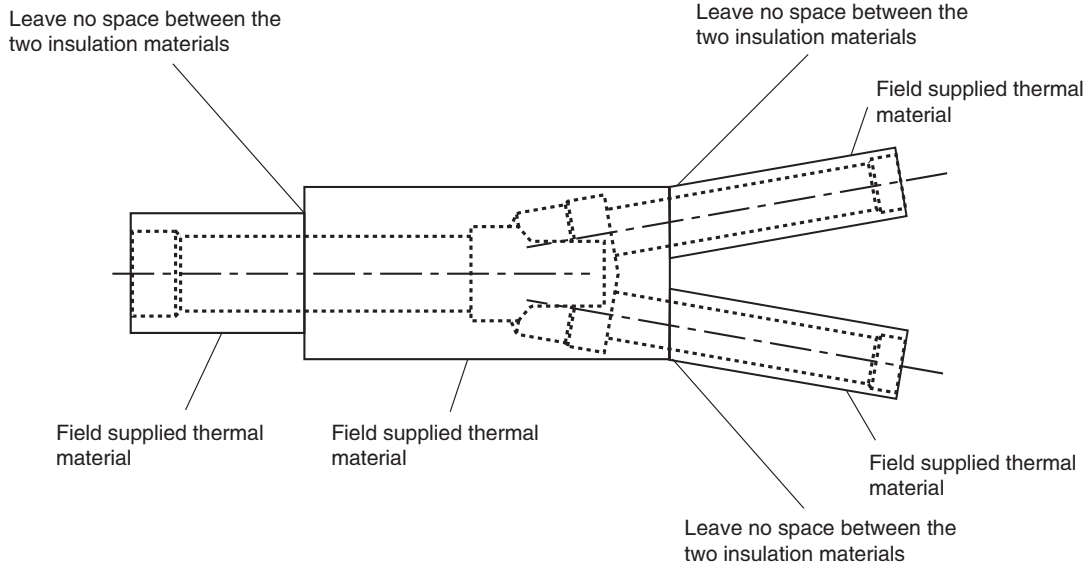
### ② Vertical Installation



### ● Thermal Insulation

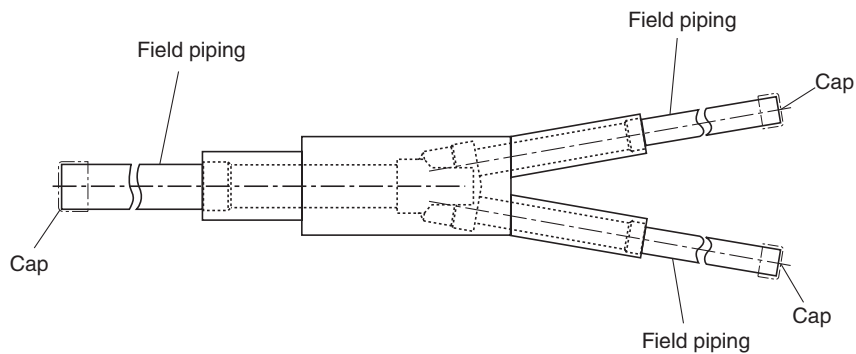
For PE foam, when the outside diameter of pipes is 12.7 or below, it is recommended to use the material with the depth of no less than 15mm, and no less than 20mm for pipes of 15.88mm or above; so the thermal insulation materials should resist at least 120 °C for the high temperature of pipes.

Apply PVC thermal insulating material for multi-kits, and field thermal materials for pipes.



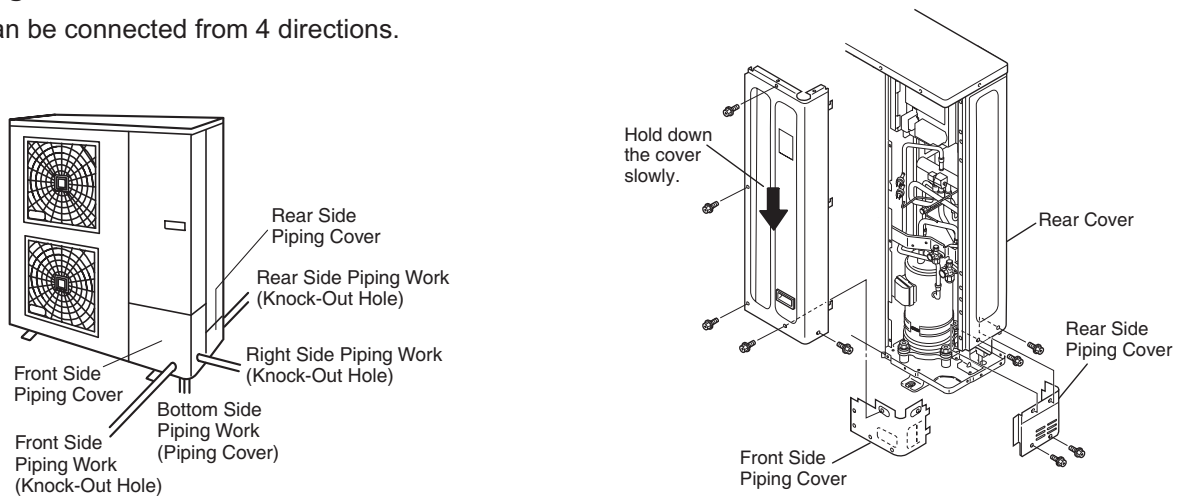
## ⚠ CAUTION

- Wait until the temperature of the pipe falls to room temperature to do thermal insulation, or the material might be melted.
- After piping, seal the ends of pipes with cap or PE tape to avoid moisture and dust entering.



### 5.3 Piping Connection

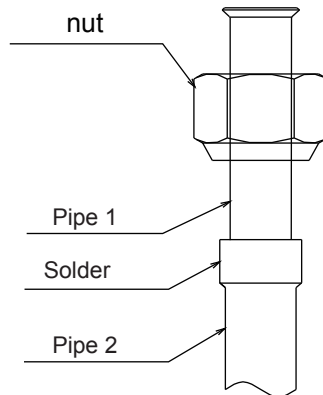
Pipes can be connected from 4 directions.



Remove the screws with holding down the cover. If not, the cover may fall down (It weights approx. 5kg.).

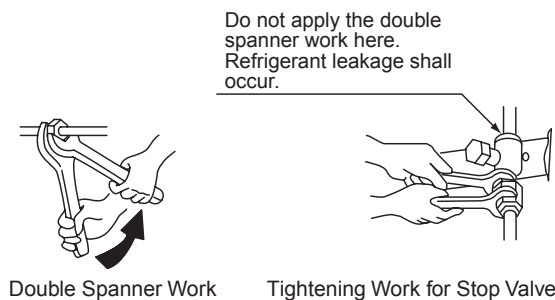
Fig. 5.1 Piping Direction

- (1) Confirm that the valve is closed.
- (2) Prepare a field-supplied bend pipe for liquid line. Connect it to the liquid valve by flare nut through the square hole of bottom base.
- (3) For Gas Piping Connection
  - ( a ) Remove the nut from the gas side stop valve and set pipe 1 into it ,then braze pipe 1 and pipe 2.



- ( b ) Prepare a field-supplied bend pipe for gas line. Braze it and the factory-supplied pipe flange at the outside of the unit.

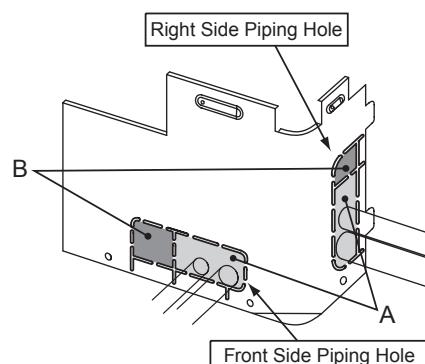
- (4) Braze the bend pipes and field piping.
- (5) For Liquid Piping Connection When tightening the flare nut, use two spanners.



Pipe Size	Tightening Torque for Flare Nut
φ6.35 (1/4)	20N-m
φ9.53 (3/8)	40N-m
φ12.7 (1/2)	60N-m
φ15.88 (5/8)	80N-m
φ19.05 (3/4)	100N-m

- (6) Pipes can be connected from 4 directions as shown Fig. 5.1. Make a knock-out hole in the front pipe cover or bottom base to pass through the hole. After removing the pipe cover from the unit, punch out the holes following the guide line with screwdriver and a hammer. Then, cut the edge of the holes and attach insulation (Field-Supplied) for cables and pipes protection.

- (a) Front and Right Side Piping Work Select the correct knock-out size depending on whether it is for power wiring or transition wiring.

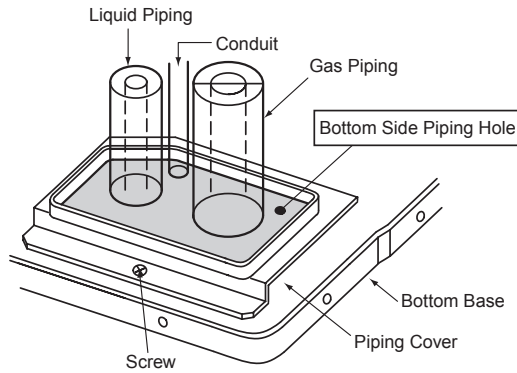


It is available to correct the liquid or gas piping, power wiring less than 14mm<sup>2</sup> and transition wiring from "A" part.

**NOTE:**

When using conduit, check to the tube size before removing "B" part.

- (b) Bottom Side Piping Work After removing bottom of the piping cover, perform piping and wiring works.

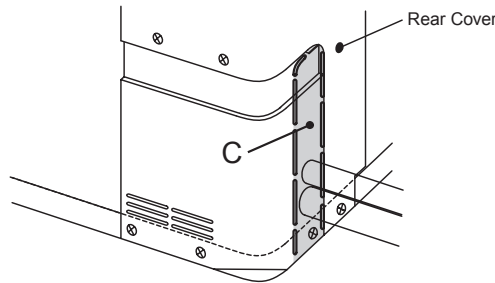


**NOTE:**

Prevent the cables from coming into direct contact with the piping.

- (c) Rear Piping Work

After removing rear piping cover, punch out the “C” holes along the guide line.



**NOTE:**

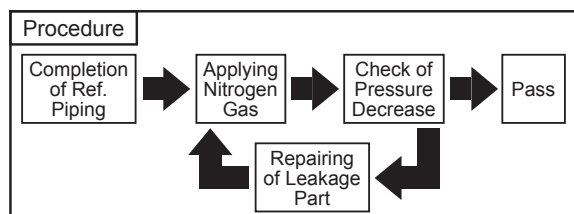
To avoid damage protect cables and pipes with adequate insulation (Field-Supplied).

- (7) To prevent gaps use a rubber bush and insulation (Factory-Supplied) adequately when installing the piping cover. Cut the lower side guide line of the piping cover when attaching work is difficult. If not, it will be included water in the unit and electrical parts will be damaged.
- (8) Use a pipe bender or elbow (Field-Supplied) for bending work when connecting pipe.

**5.4 Air-tight Test**

- (1) The stop valve has been closed before shipment, however, make sure that the stop valves are closed completely.
- (2) Connect the indoor unit and the outdoor unit with field-supplied refrigerant piping. Suspend the refrigerant piping at certain points and prevent the refrigerant piping from touching the weak part of the building such as wall, ceiling, etc. (If touched, abnormal sound may occur due to the vibration of the piping. Pay special attention in case of short piping length.)
- (3) Apply the oil thinly at the seat surface of the flare nut and pipe before tightening. And when tightening the flare nut, use two spanners.

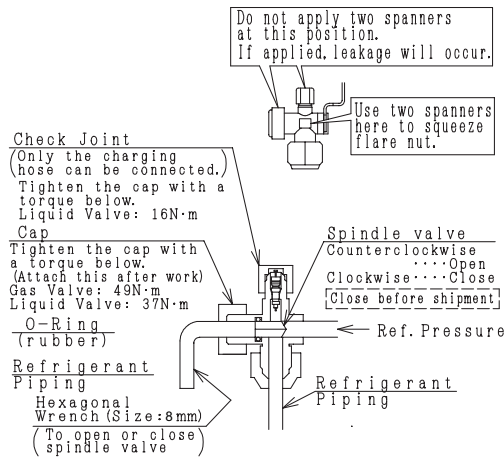
Refrigerant Oil is field-supply.  
 ( Model: FVB68D (Ether Oil)  
 Manufacturer: IDEMITSU KOSAN Co., Ltd. )





(4) Stop Valve Operation of the stop valve should be performed according to the below.

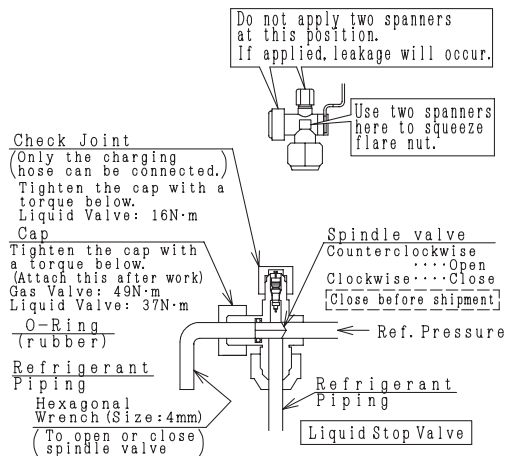
<Gas Valve>



Spindle Valve Torque (N·m)

Gas	Liquid
9~11	7~9

<Liquid Valve>



Hexagonal Wrench Size (mm)

Gas	Liquid
8	4

**CAUTION**

- Do not apply an abnormal big force to the spindle valve at the end of opening (5.0N·m or smaller). The back seat construction is not provided.
- Do not loosen the stop ring. If the stop ring is loosened, it is dangerous, since the spindle will hop out.
- At the test run, fully open the spindle. If not fully opened, the devices will be damaged.

- (5) Connect the gauge manifold using charging hoses with a nitrogen cylinder to the check joints of the liquid line and the gas line stop valves. Perform the air-tight test. Do not open the stop valves. Apply nitrogen gas pressure of 4.15MPa.
- (6) Check for any gas leakage at the flare nut connections, or brazed parts by gas leak detector or foaming agent.
- (7) After the air tight test, release nitrogen gas.

## 5.5 Vacuum Pumping

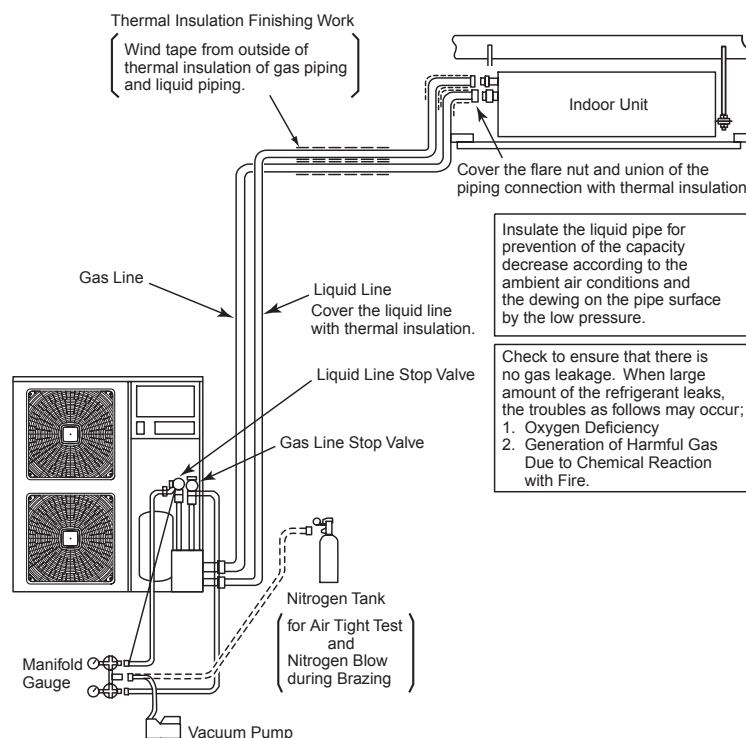
- (1) Connect a mani-fold gauge to the check joints at the both sides. Continue vacuum pumping work until the pressure reaches -756mmHg or lower for one to two hours.
- (2) After vacuum pumping work, stop the mani-fold valve's valve, stop the vacuum pump and leave it for one hour. Check to ensure that the pressure in the mani-fold gauge does not increase.
- (3) Fully open the gas valve and liquid valve.
- (4) This system is not necessary to charge refrigeration less than 30m of the actual piping length. If the total piping length is more than 30m, it is necessary additional refrigerant charge.
- (5) Check for any gas leakage by gas leak detector or forming agent. Use the foaming agent which does not generate the ammonia (NH<sub>3</sub>) by chemical reaction. The recommended forming agent are as shown below. Do not use general household detergent for checking.

Foaming Agent	Manufacturer
SNOOP	NUPRO (U.S.A.)
Gupoflex	YOKOGAWA & CO., LTD

### NOTES:

1. When the spindle cap for stop valve is removed, the gas accumulated at O-ring or screws is released and may make sound. This phenomenon is NOT a gas leakage.
2. This unit is only for the refrigerant R410A. The manifold gauge and the charging hose should be exclusive use for R410A.
3. If vacuum degree of -0.1MPa (-756mmHg) is not available, it is considered of gas leakage or entering moisture. Check for any gas leakage once again. If no leakage exists, operate the vacuum pump for more than one to two hours.

**Never use the refrigerant charged in the outdoor unit for air purging.  
Insufficient refrigerant will lead to failure.**



# ⚠ CAUTION

- At the test run, fully open the spindle. If not fully opened, the devices will be damaged.
- An excess or a shortage of refrigerant is the main cause of trouble to the units. Charge the correct refrigerant quantity according to the description of label at the inside of service cover.
- Check for refrigerant leakage in detail. If a large refrigerant leakage occurs, it will cause difficulty with breathing or harmful gases would occur if a fire was being used in the room.

## (6) Additional Refrigerant Charge

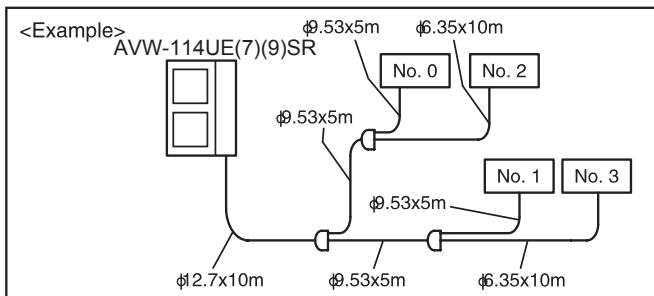
If total piping length is more than 30m, it is necessary additional refrigerant charge as follows.

### Additional Refrigerant Charge Calculation

Although refrigerant has been charged into this unit, it is required that additional refrigerant be charged according to piping length.

- A. Determine an additional refrigerant quantity according to the following procedure, and charge it into the system.
- B. Record the additional refrigerant quantity to facilitate service activities thereafter.

#### 1. Calculating Method of Additional Refrigerant Charge (W kg)



See Example for Model AVW-114UE(7)(9)SR, and fill in the following table.

Pipe Diameter (mm)	Total Piping Length (m)	Additional Charge (kg)
φ 12.7 .....	(10)	x 0.12 = 1.2
φ 9.53 .....	(5 + 5 + 5 + 5)	x 0.07 = 1.4
φ 6.35 .....	(10 + 10)	x 0.03 = 0.6
<b>Total Piping Length</b>	<b>50m</b>	<b>Additional Charge W<sub>1</sub> = 3.2 (kg)</b>

$$\begin{aligned} \text{Additional Charge } W &= W_1 - P \\ &= 3.1 - 2.0 = 1.1 \text{ (kg)} \end{aligned}$$

Pipe Diameter (mm)	Total Piping Length (m)	Additional Charge (kg)
φ 12.7 .....	<input type="text"/>	x 0.12 = <input type="text"/>
φ 9.53 .....	<input type="text"/>	x 0.07 = <input type="text"/>
φ 6.35 .....	<input type="text"/>	x 0.03 = <input type="text"/>
<b>Total Piping Length</b>	<input type="text"/> m	<b>Additional Charge W = <input type="text"/> (kg)</b>

<Table 1>

Outdoor Unit	W <sub>0</sub> : Outdoor Unit Ref. Charge (kg)	
AVW-76UE(7)(9)SR	5.0	
AVW-96UE(7)(9)SR	5.5	
AVW-114UE(7)(9)SR	6.5	

NOTE:  
W<sub>0</sub> is outdoor unit ref. charge before shipment.

#### 2. Charging Work

Charge refrigerant (R410A) into the system as follows.

- (1) For charging refrigerant, connect the gauge mani-fold using charging hoses with a refrigerant cylinder to the check joint of the liquid line stop valve.
- (2) Fully open the gas line stop valve and slightly open the liquid line stop valve.  
Charge refrigerant by opening the gauge mani-fold valve.
- (3) Charge the required refrigerant by operating the system in cooling.  
Ensure to charge correct volume by utilizing a weight scale. An excess or shortage of refrigerant is the main cause of trouble to the units.  
Fully open the liquid line stop valve after completing refrigerant charge.

#### 3. Record of Additional Charge

Record the refrigerant charging quantity in order to facilitate maintenance and servicing activities.

Total refrigerant charge of this system is calculated in the following formula.

$$\begin{aligned} \text{Total Ref. Charge of This System} &= W + W_0 \\ \text{This System} &= \text{} + \text{} = \text{ kg} \end{aligned}$$

Total Additional Charge W	<input type="text"/> kg
Total Ref. Charge of This System	<input type="text"/> kg
Date of Ref. Charge Work	
Day <input type="text"/>	Month <input type="text"/> Year <input type="text"/>

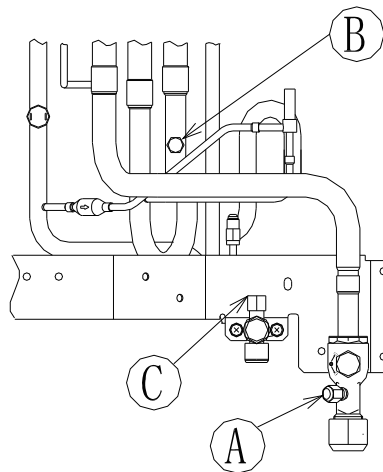
## 5.6 Caution of the Pressure by Check Joint

When the pressure is measured, use the check joint of gas stop valve ((A) in the figure below) and use the check joint of liquid piping ((B) in the figure below). At that time, connect the pressure gauge according to the following table because of high pressure side and low pressure side changes by operation mode.

	Cooling Operation	Heating Operation
Check Joint for Gas Stop Valve "A"	Low Pressure	High Pressure
Check Joint for Piping "B"	High Pressure	Low Pressure
Check Joint for Liquid Stop Valve "C"	Exclusive for Vacuum Pump and Refrigerant Charge	

### NOTE:

Be careful that refrigerant and oil do not splash to the electrical parts at removing the charge hoses.



1. Maximum Permissible Concentration of HFC GAS R410A charged in the DC INVERTER is an incombustible and non-toxic gas.  
However, if leakage occurs and gas fills a room, it may cause suffocation. The maximum permissible concentration of HCFC gas, R410A in air is 0.3kg/m<sup>3</sup>, according to the refrigeration and air conditioning facility standard (KHK S 0010) by the KHK (High Pressure Gas Protection Association) Japan. Therefore, some effective measure must be taken to lower the R410A concentration in air below 0.3kg/m<sup>3</sup>, in case of leakage.
2. Calculation of Refrigerant Concentration
  - (1) Calculate the total quantity of refrigerant R (kg) charged in the system connecting all the indoor units of objective rooms.
  - (2) Calculate the room volume V (m<sup>3</sup>) of each objective room.
  - (3) Calculate the refrigerant concentration C (kg/m<sup>3</sup>) of the room according to the following equation.

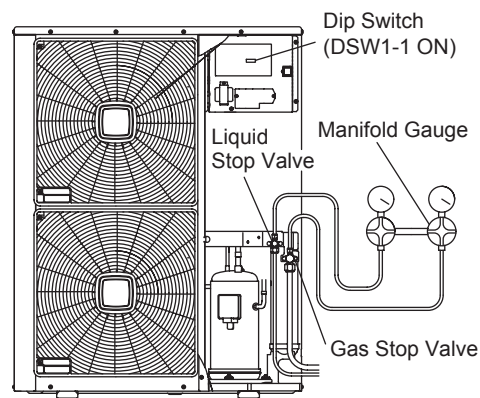
$$\frac{R: \text{Total Quantity of Charged Refrigerant (kg)}}{V: \text{Room Volume (m}^3\text{)}} = C: \text{Refrigerant Concentration} \dots\dots 0.3 \text{ (kg/m}^3\text{)}$$

If local codes or regulations are specified, follow them.

## 5.7 Collecting Refrigerant

When the refrigerant should be collected into the outdoor unit due to indoor/outdoor unit relocation, collect the refrigerant as follows.

- (1) Attach the manifold gauge to the gas stop valve and the liquid stop valve.
- (2) Turn ON the power source.
- (3) Set the DSW1-1 pin of the outdoor unit PCB at the "ON" side for cooling operation. Close the liquid stop valve and collect the refrigerant.
- (4) When the pressure at lower pressure side (gas stop valve) indicates  $-0.01\text{MPa}$  ( $-100\text{mmHg}$ ), perform the following procedures immediately.
  - \* Close the gas stop valve.
  - \* Set the DSW1-1 pin at the "OFF" side. (To stop the unit operation.)
- (5) Turn OFF the power source.



### **CAUTION**

Measure the low pressure by the pressure gauge and keep it not to decrease than  $-0.01\text{MPa}$ . If the pressure is lower than  $-0.01\text{MPa}$ , the compressor may be faulty.

## 6. Electrical Wiring

### ! WARNING

- Turn OFF the main power switch to the indoor unit and the outdoor unit and wait for more than 1 minute before electrical wiring work or a periodical check is performed.
- Check to ensure that the indoor fan and the outdoor fan have stopped before electrical wiring work or a periodical check is performed.
- Protect the wires, electrical parts, etc. from rats or other small animals. If not protected, rats may gnaw at unprotected parts and at the worst, a fire will occur.
- Avoid the wirings from touching the refrigerant pipes, plate edges and electrical parts inside the unit. If not do, the wires will be damaged and at the worst, a fire will occur.

### ! CAUTION

- Tightly secure the power source wiring using the cord clamp inside the unit.

### NOTE

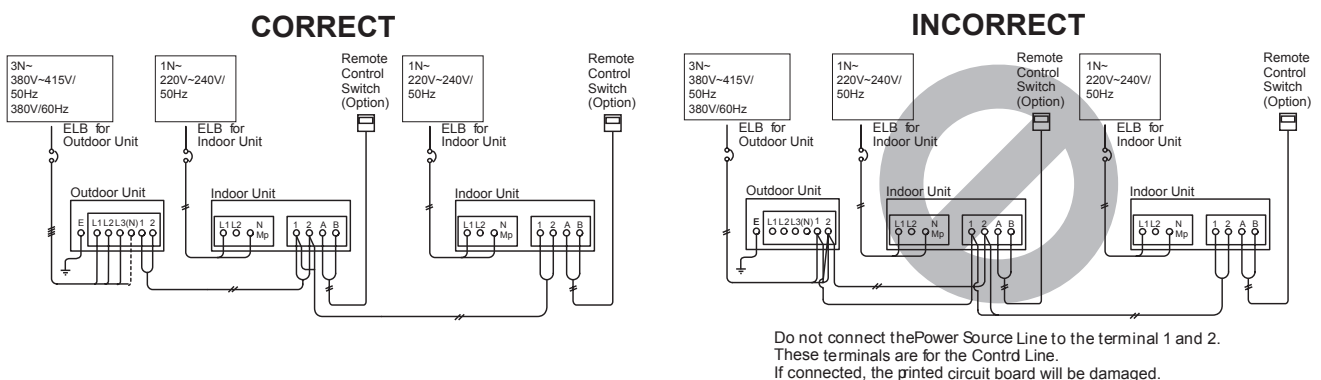
Fix the rubber bushes with adhesive when conduit tubes to the outdoor unit are not used.

### 6.1 General Check

- (1) Make sure that the field-selected electrical components (main power switches, circuit breakers, wires, conduit connectors and wire terminals) have been properly selected according to the electrical data. Make sure that the components comply with National Electrical Code (NEC).
- (2) Check to ensure that the voltage of power supply is within +10% of nominal voltage and earth phase is contained in the power supply wires. If not, electrical parts will be damaged.
- (3) Check to ensure that the capacity of power supply is enough. If not, the compressor will be not able to operate cause of voltage drop abnormally at starting.
- (4) Check to ensure that the earth wire is connected.
- (5) Check to ensure that the electrical resistance is more than 1 megohm, by measuring the resistance between ground and the terminal of the electrical parts. If not, do not operate the system until the electrical leakage is found and repaired.

### 6.2 Electrical Wiring Connection

- (1) Connect the power supply wires to the terminal board in the electrical control box of both outdoor unit and indoor unit. And connect the earth wire to the electrical control box of outdoor unit. In addition, connect the earth wire to earth screw in the electrical control box of indoor unit. Refer to Fig. 6.2, Fig. 6.3 and Fig. 6.4.
- (2) Connect the wires between the outdoor and indoor units to terminals 1 and 2 on the terminal board. If power supply wiring is connected to 1 and 2 of terminal board (TB1), printed circuit board will be damaged.



- (3) Do not wire in front of the fixing screw of the service panel. If do, the screw can not be removed.
- (4) In case that the power source is 240V, change CN1 (connector) to CN2 of transformer in the electrical control box as shown in Fig. 6.1.

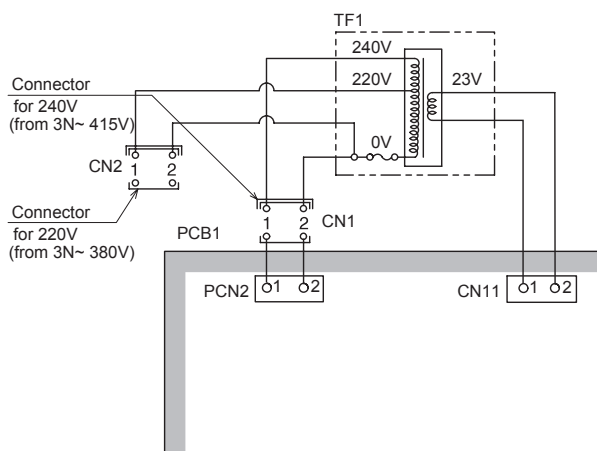


Fig. 6.1 Connector of Transformer of Outdoor Unit

- (5) Connect the electrical wires between the indoor unit and the outdoor unit, as shown in Fig. 6.2, Fig. 6.3 and Fig. 6.4. Check to ensure that the terminal for power source wiring of each terminal board: AC220-240V between the indoor unit and the outdoor unit coincide correctly. If not, some component will be damaged.
- (6) Use twist pair cable with shielded for control between outdoor unit and indoor unit, control wiring between indoor units, wiring (1 and 2) for remote control switch of HYXC-A01H and transmission wiring (A and B) for remote control switch of HYXC-A01H.

**NOTES:**

1. In case of total wiring length at intermediate wiring between outdoor unit and indoor unit and between indoor units is less than 100m, it is possible to use the normal wiring (more than 0.75mm<sup>2</sup>) except twist pair cable.
2. Total wiring length for remote control switch can be extended up to 500m. If total wiring length less than 30m, it is possible to use the normal wiring (0.3mm<sup>2</sup>) except twist pair cable.

**! CAUTION**

In Case of 3 Phases 4 Wires Type The power source has to be applied from L1 line and N line. If applied from L1-L2, L1-L3, the electrical parts will be damaged to outdoor unit and indoor unit.

**! WARNING**

- Install an ELB in the power source. If ELB is not used, it will cause electric shock or fire at the worst.
  - The tightening torque of each screw shall be as follows.
 

M4:	1.0 to 1.3 N-m
M5:	2.0 to 2.5 N-m
M6:	4.0 to 5.0 N-m
M8:	9.0 to 11.0 N-m
M10:	18.0 to 23.0 N-m
- Keep the above tightening torque when wiring work.

- (7) The recommended breaker sizes etc. are shown in Table 6.1.
- (8) In the case that a conduit tube for field-wiring is not used, fix rubber bushes with adhesive on the panel.

### Max. 1 Outdoor Unit/Power Supply Line

The Power source for outdoor units must be made individually.  
If not, fire may occur in the worst case.

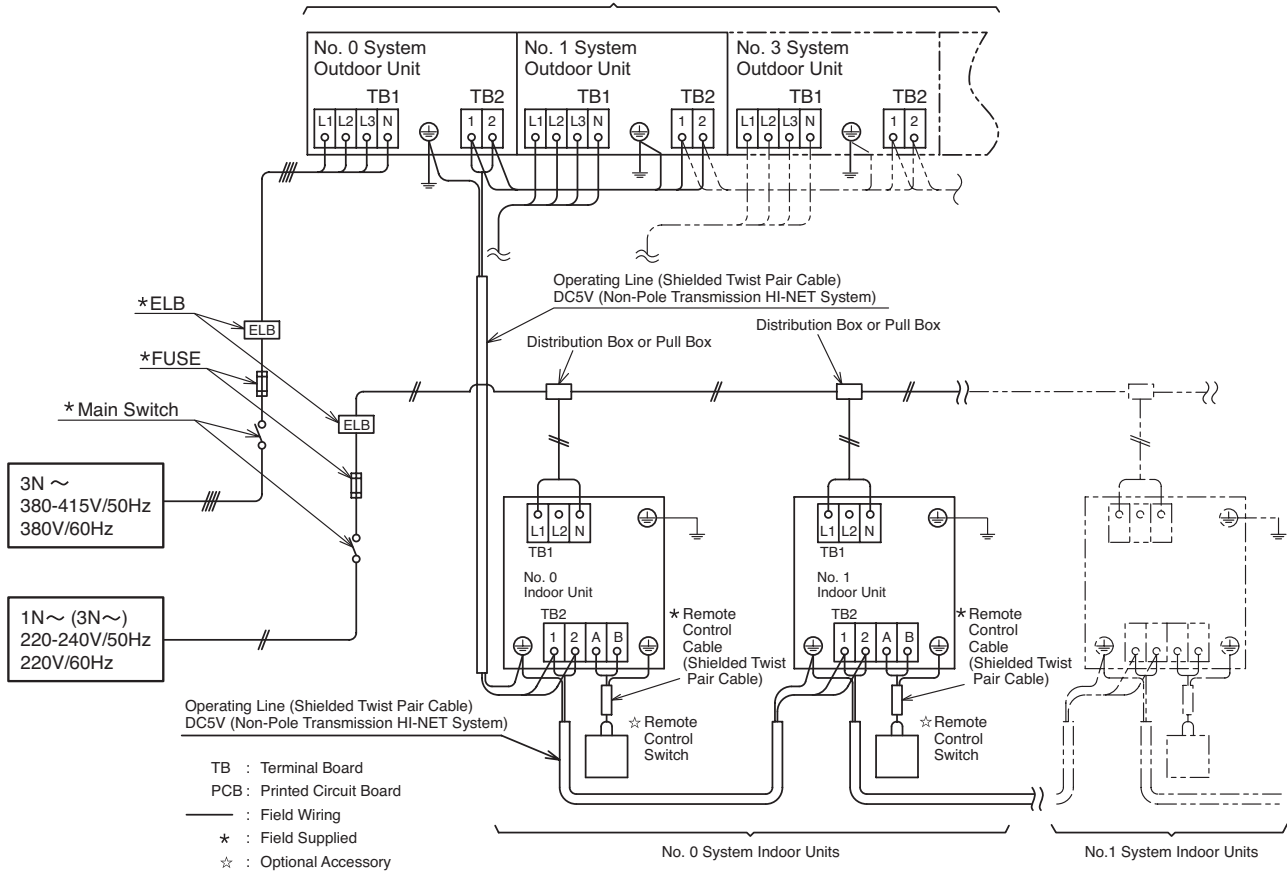


Fig. 6.2 Instruction for Electrical Wiring Connection (380-415V/50Hz, 380V/60Hz)

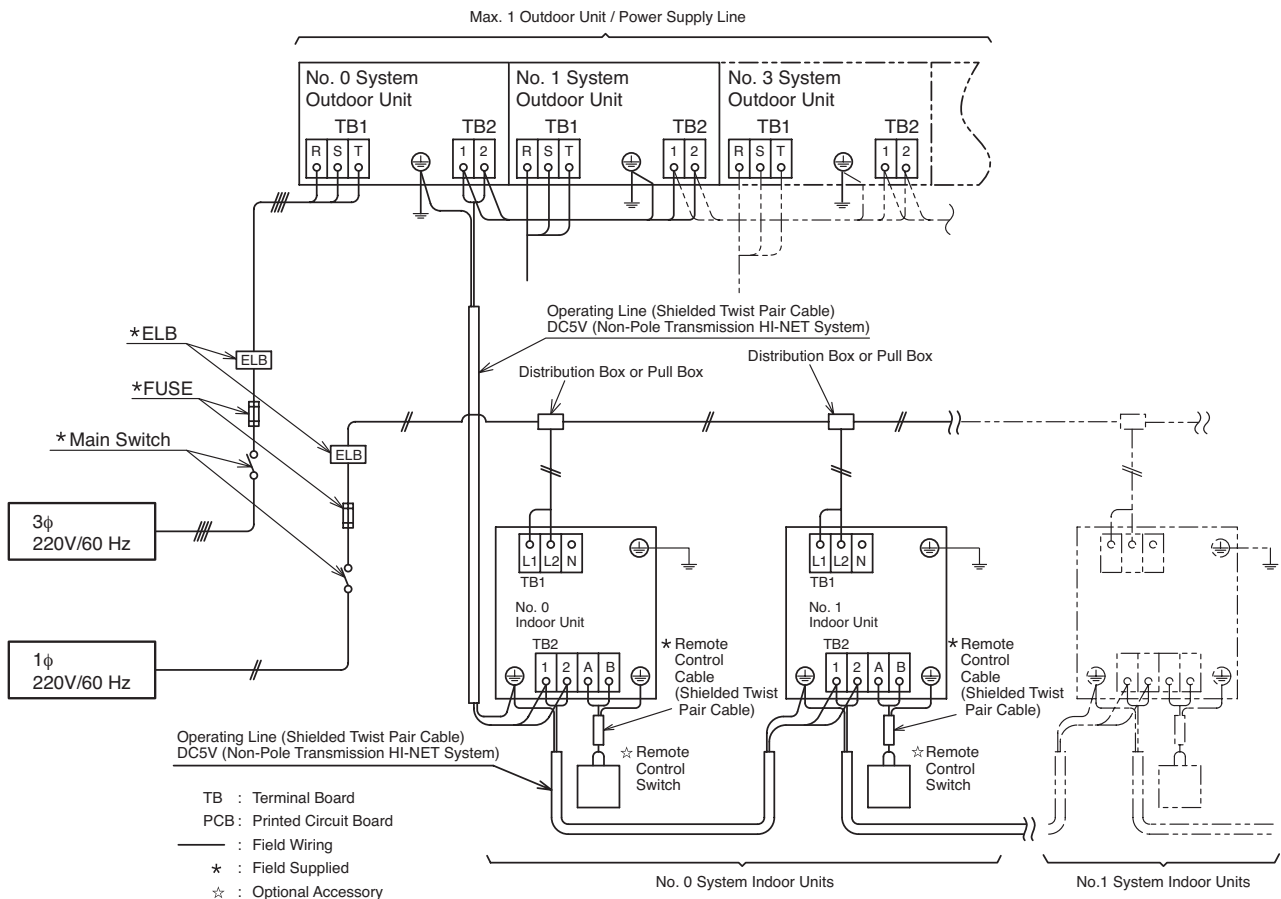


Fig. 6.3 Instruction for Electrical Wiring Connection (220V/60Hz)



Table 6.1 Electrical Data and Recommended Wiring, Breaker Size/1 Outdoor Unit

Model	Power Supply	Maximum Running Current (A)	Power Supply Line (mm <sup>2</sup> )	ELB		Fuse (A)
				Nominal Current (A)	Nominal Sensitive Current (mA)	
AVW-76U9SR	220V 60Hz	22	MLFC3.5SQ	30	30	30
AVW-96U9SR		29	MLFC5.5SQ	40	30	40
AVW-114U9SR		37	MLFC5.5SQ	50	100	50
AVW-76UE(7)SR	380-415V 50Hz 380V 60Hz	20.5	MLFC2.0SQ	30	30	30
AVW-96UE(7)SR		26	MLFC3.5SQ	40	30	40
AVW-114UE(7)SR		26	MLFC3.5SQ	40	30	40

ELB: Earthleakage Breaker, MLFC: Flame Retardant Polyflex Wire

■ Field Minimum Wire Sizes for Power Source

Model	Power Supply	Maximum Current	Power Source Cable Size		Transmitting Cable Size
			EN60 335-1 *1	MLFC *2	Shielded Twist Pair Cable
AVW-76U9SR	220V 60Hz	22	4.0mm <sup>2</sup>	3.5mm <sup>2</sup>	0.75mm <sup>2</sup>
AVW-96U9SR		29	6.0mm <sup>2</sup>	5.5mm <sup>2</sup>	
AVW-114U9SR		37	10.0mm <sup>2</sup>	5.5mm <sup>2</sup>	
AVW-76UE(7)SR	380-415V 50Hz 380V 60Hz	20.5	2.5mm <sup>2</sup>	2.0mm <sup>2</sup>	0.75mm <sup>2</sup>
AVW-96UE(7)SR		26	4.0mm <sup>2</sup>	3.5mm <sup>2</sup>	
AVW-114UE(7)SR		26	4.0mm <sup>2</sup>	3.5mm <sup>2</sup>	

\* Refer to the NOTES for selection of the power source cable size.

NOTES:

- 1) Follow local codes and regulations when selecting field wires.
- 2) The wire sizes marked with \*1 in the table of previous page are selected at the maximum current of the unit according to the European Standard, EN60 335-1. Use the wires which are not lighter than the ordinary tough rubber sheathed flexible cord (code designation H05RN-F) or ordinary polychloroprene sheathed flexible cord (code designation H05RN-F).
- 3) Use a shielded cable for the transmitting circuit and connect it to ground.
- 4) In the case that power cables are connected in series, add each unit maximum current and select wires below.

**Selection According to EN60 335-1**

Current i(A)	Wire Size (mm <sup>2</sup> )
$i \leq 6$	2.5
$6 < i \leq 10$	2.5
$10 < i \leq 16$	2.5
$16 < i \leq 25$	4.0
$25 < i \leq 32$	6.0
$32 < i \leq 40$	10.0
$40 < i \leq 63$	16.0
$63 < i$	*2

\*2: In the case that current exceeds 63A, do not connect cables in series.

# ! CAUTION

**Install a multi-pole main switch with a space of 3.5mm or more between each phase.**

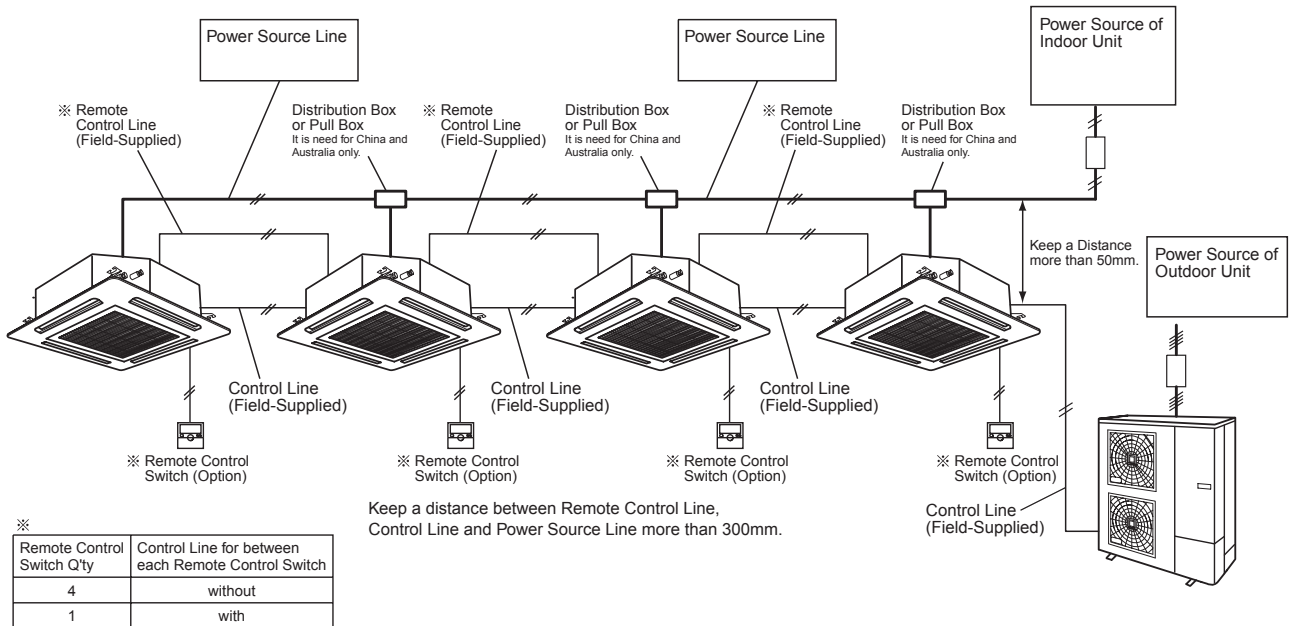


Fig. 6.4 Instruction for Electrical Wiring Connection

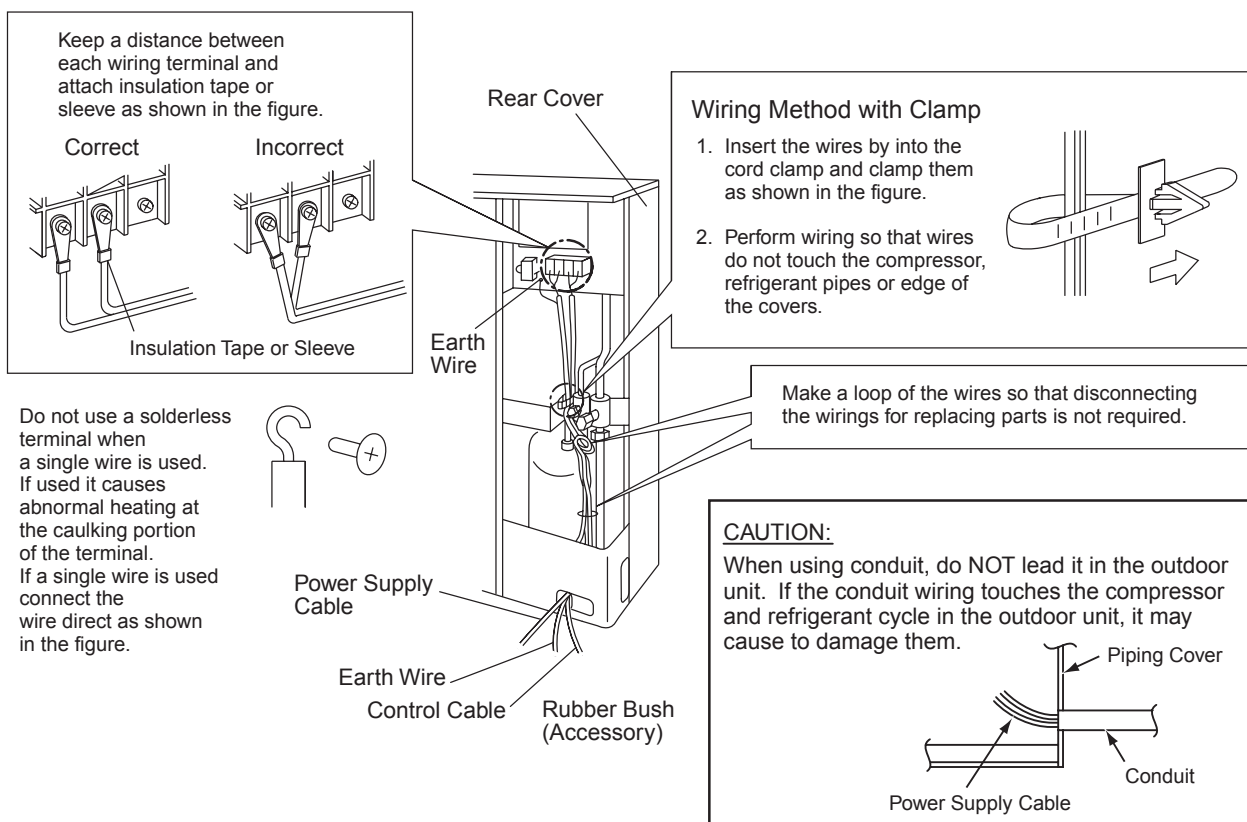


Fig. 6.5 Wiring Connection of Outdoor Unit

### 6.3 Electrical Wiring of Indoor Unit and Outdoor Unit

As shown in Fig.6.2, connect the electrical wires between the indoor unit and the outdoor unit and among the indoor units. Check to ensure both power terminals and communication terminals are connected correctly. If not, some components will be damaged.

#### Terminal Wiring

Wire	Terminal Connection	
Power Wire	O.U.-O.U.	L1-L1, L2-L2, L3-L3, N-N
	I.U.-I.U.	L-L, N-N
Communication Wire	O.U.-O.U.	1-1, 2-2
	I.U.-I.U.	

- 1) Make sure that electrical wires' connections comply with the local codes.
- 2) Supply electrical power to each outdoor unit. An ELB and knife switch should be used for each outdoor unit.
- 3) Supply electrical power to each indoor unit, all indoor units connected to the same outdoor unit use an ELB and knife switch.
- 4) Connect the controlling wire to the same refrigerant system. If not, the operation won't work regularly.
- 5) Use shielded wires( $\geq 0.75\text{mm}^2$ ) for intermediate wiring between indoor units, indoor and outdoor unit at length of less than 1000m.
- 6) Use twisted-wire as the controlling wire (do not use three-wire or above).
- 7) To avoid interruption, the length of wire should be less than 300m and the shielded wire should be used according to the local codes in size.

For non-HI-NET system, connect controlling wire to the units of a same cooling system (refrigerant piping and controlling wire should be connected to the same unit). If not, the operation won't work regularly.

- 8) The recommended breaker sizes are shown in table 6.1
- 9) In the case that a conduit tube for field wiring is not used, fix rubber bushes with adhesive on the panel.

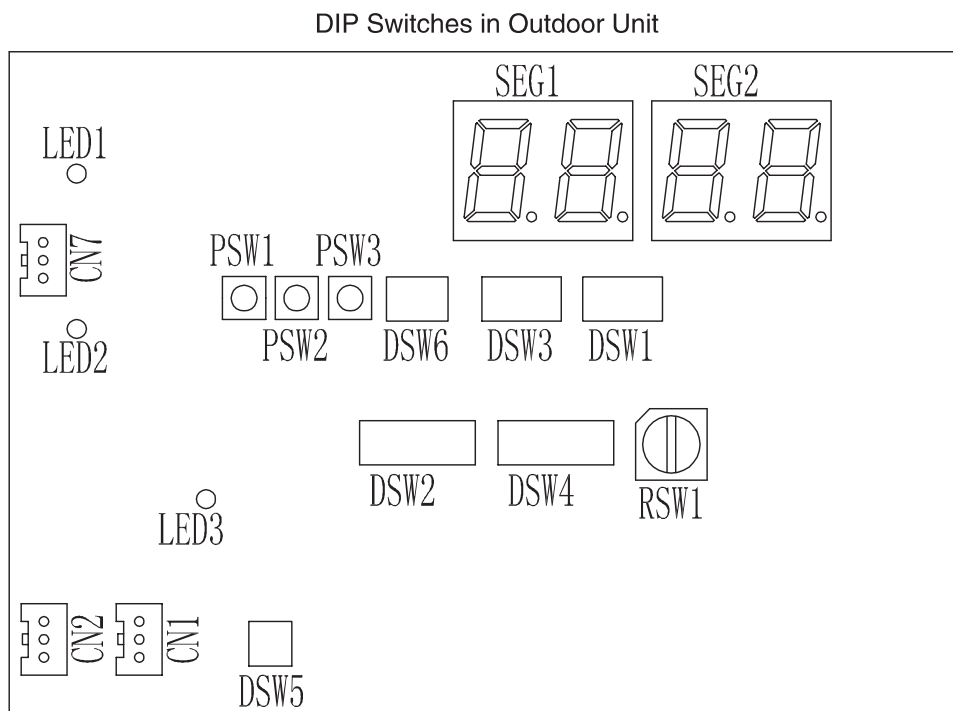
### 6.4 DIP Switch Setting of Outdoor Unit

Turn off all power sources before setting. Without turning off, the switches do not work and the contents of the setting are invalid. “■” means the location of dip switches.

The setting can refer to “HI-NET system” in chapter 6.5 for HI-NET system, setting of PCB1.

#### PCB1 Dip Switch Setting

#### DIP Switches Layout (PCB1)



## 6.5 HI-NET System

Note:

HI-NET SYSTEM cannot be used for old models or old communication system!

### (1) Application

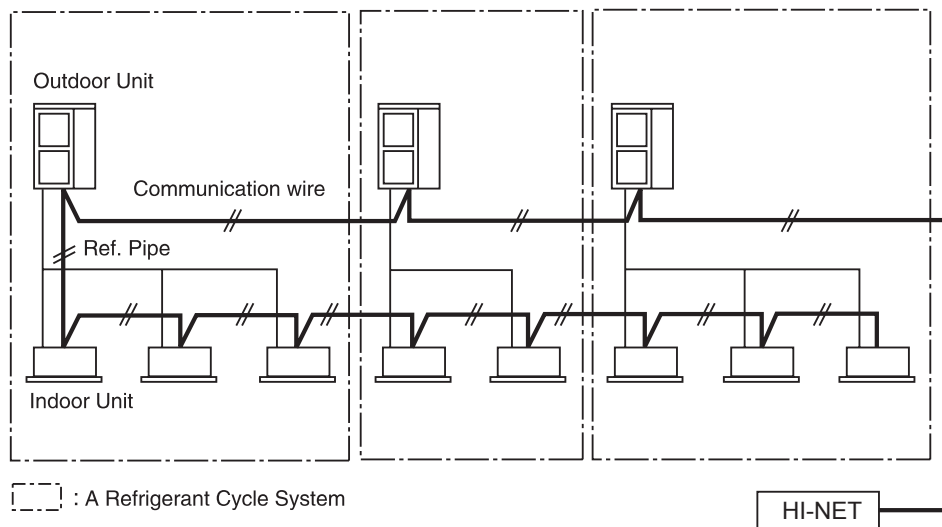
New HI-NET wiring system needs only two communication wires to connect each outdoor and indoor unit. The same HI-NET system can connect up to 64 refrigerant cycles and all the outdoor and indoor units can be connected in series.

### (2) Features

Features of the new HI-NET system:

- Total length of wires is remarkably reduced.
- There is only one connection circuit between outdoor unit and indoor unit.
- Easy to connect to the central controller

### HI-NET System Example



Specification:

- Communication Wire: Shilded Twisted Pair
- Polarity of Tranmission: Non-Polar Wire
- Max. Numbers of O.U. to be Connected: 64 Sets for Each HI-NET
- Max. Numbers of I.U. to be Connected: 64 Sets for Each Refrigerant Cycle and 128 for each

HI-NET

- Max. Wiring Length: 1000m (inc.HI-NET)
- Recommended Wire: Shilded Twisted Pair,  $\geq 0.75\text{mm}^2$
- Voltage: DC5V

Note:

HI-NET system can only use twisted pair cable but other types of wires.

Please set DIP switch if HI-NET system is applied.

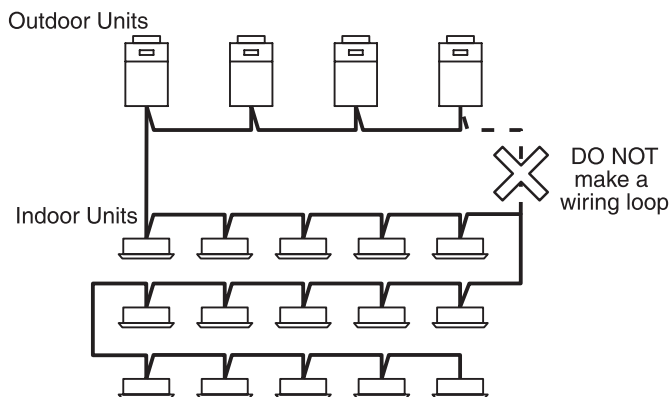
The incorrect DIP setting would cause an alarm due to communication failure.

(3) System Example of HI-NET

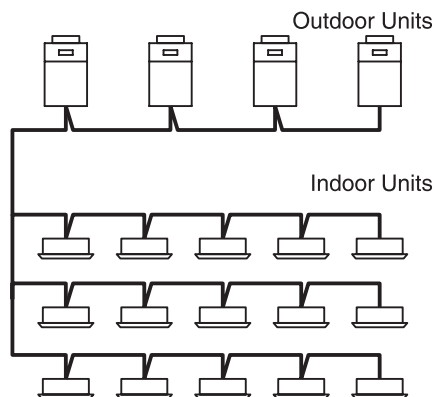
There are two typical cases of using HI-NET system; (a) Using HI-NET System For Only Air Conditioners, and (b) Using HI-NET System For Air Conditioners with Central Control Device, and the system examples are as shown below.

(a) Using HI-NET System For Only Air Conditioners

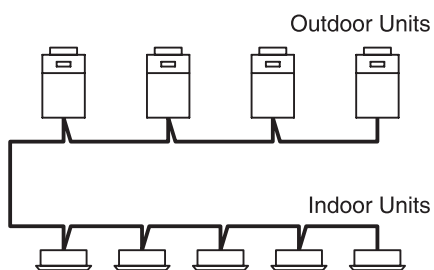
① Line Connection with All Units



② Line Connection for Each Floor

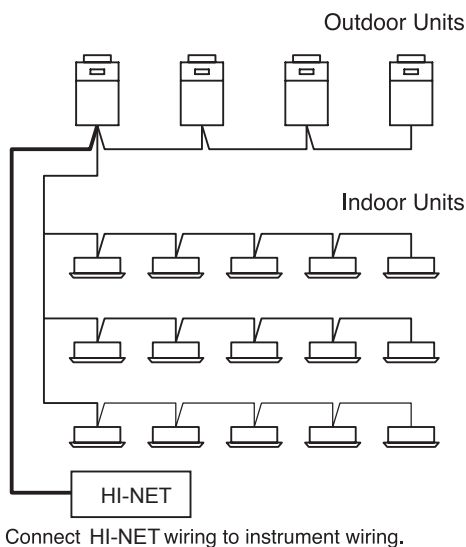


③ Connection with One Main Line and Branch Lines for Units

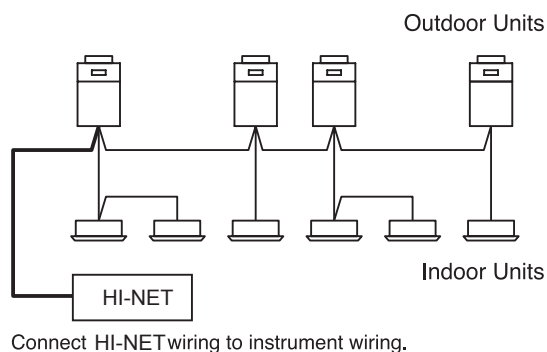


(b) Using HI-NET System For Air Conditioners with Central Control Device

① In case that HI-NET is applied when electrical wiring is performed.



② In case that HI-NET is not applied when electrical wiring is performed.



**NOTE**

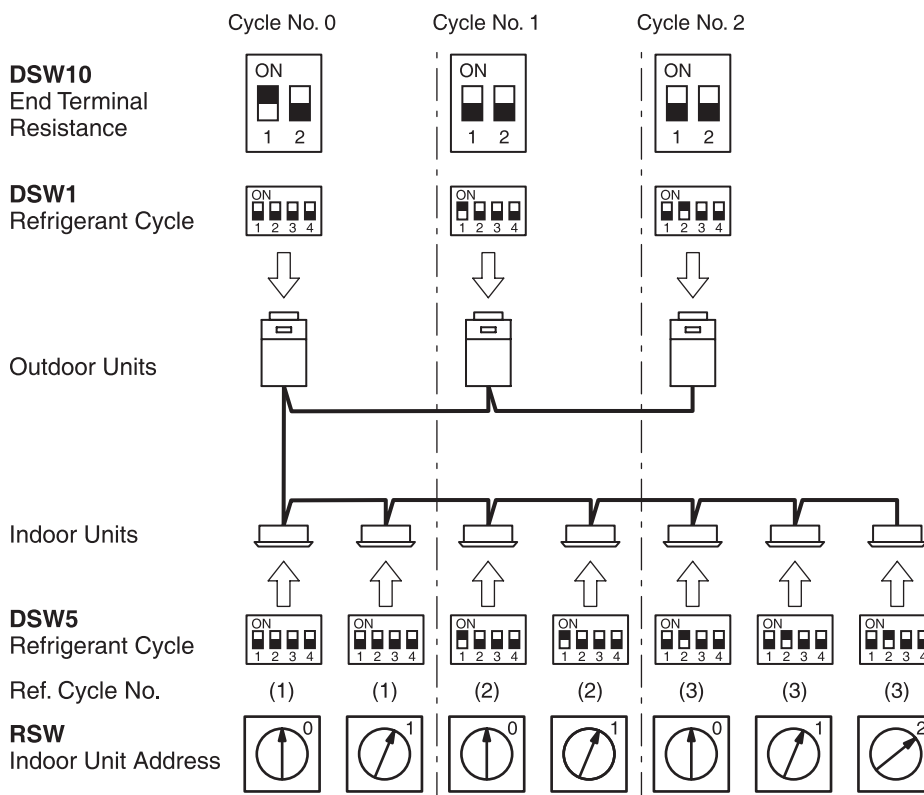
1. The maximum quantity of units to be connected is 64 outdoor units and 160 indoor units.
2. Do not make a wiring in a loop.
3. In the case of (b)-② as shown above, HI-NET is applied after the instrument wiring is completed. Therefore, the dip switches are required to be set according to "Setting of Dip Switches on PCB".

(4) Dip Switch Setting of Indoor PCB and Outdoor PCB

It is required to set dip switches of every indoor unit and outdoor unit and match of the transmission circuit impedance.

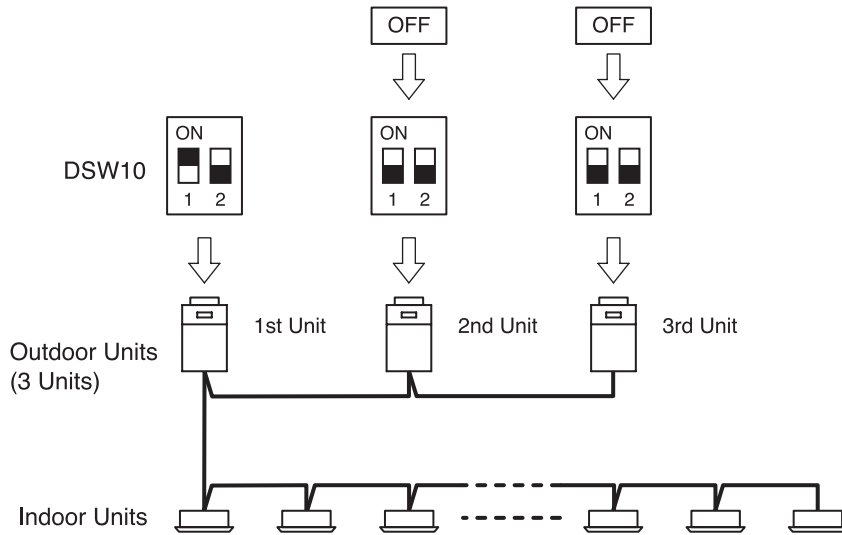
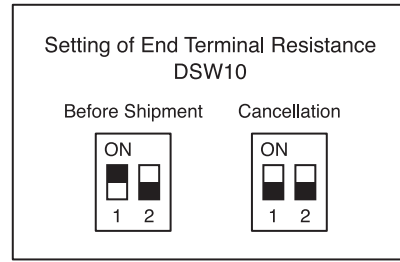
(a) Dip Switch Setting

<Dip Switch Setting Example>



	Name of Dip Switch	Mark	Setting Before Shipment	Function
Outdoor Unit	Refrigerant Cycle	DSW1		For setting refrigerant cycle address of outdoor unit. Set the DSW1 not to overlap the setting of other outdoor units in the same HI-NET system.
	End Terminal Resistance	DSW10-1P		For matching impedance of transmission circuit. Set the DSW10 according to the quantity of outdoor units in the HI-NET system.
Indoor Unit	Refrigerant Cycle	DSW5		For setting refrigerant cycle address of indoor units. Set the DSW5 corresponding to the address of outdoor unit in the same refrigerant cycle.
	Indoor Unit Address	RSW		For setting indoor unit address. Set the RSW not to overlap the setting of other indoor units in the same refrigerant cycle. (If not set, the automatic address function is performed.)

(b) Setting of End Terminal Resistance  
 Before shipment, No.1 pin of DSW10 is set at the "ON"  
 In the case that the outdoor units quantity in the same HI-NET is 2 or more, set No.1 pin of DSW10 to the "OFF" side at the 2nd unit. If only one outdoor unit is used, no setting is required.



## 6.6 Alarm Code

## Alarm Code

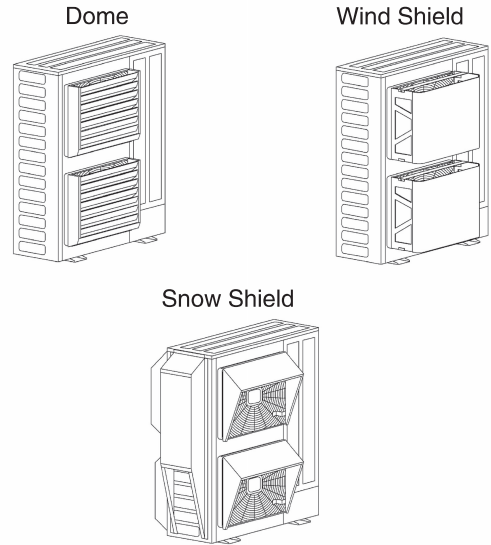
Code No.	Content of Abnormality	Leading Cause
01	Activating of Protection Device	High Water Level in Drain Pan, Activated Float Switch.
02	Activating of Protection Device (High Pressure Switch Off)	Refrigerant Pipe Blocked, too much Refrigerant, Not Condensed Gas.
03	Abnormality between Indoor and Outdoor	Incorrect Wiring. Loose Terminals, Disconnected wire, Tripping of Fuse.
05	Abnormality of Power Supply Phases	Abnormal Waveform of one or more the Supply Phases (Ex. Distortion of the Voltage Signal).
06	Voltage Drop by Excessively Low or High Voltage to Outdoor Unit	Voltage Drop of Power Supply Insufficient Capacity of Power Supply Wiring.
07	Decrease of Discharge Gas Superheat	Excessive Refrigerant Charged, Locked Opening of Exp. v/v (Connection Break), Failure of Refrigerant and Electrical Wiring Between I.U. and O.U.
08	Increase of Discharge Gas Temperature	Insufficient Refrigerant, Clogging of Ref. Piping, Locked Opening of Exp. v/v (Connection Breaks), Failure of Refrigerant and Electrical Wiring between I.U. and O.U.
09	Tripping of Protection Device of Outdoor Fan Motor	Overheat of Outdoor Fan Motor, Locked.
11	Abnormality of Indoor Unit Inlet Air Thermistor	Failure of Thermistor, Loose Terminal, Disconnected Wire.
12	Abnormality of Indoor Unit Outlet Air Thermistor	
13	Freeze Protection Thermistor	
14	Abnormality of Indoor Unit Heat Exchanger Thermistor	
16	Abnormality of Remote Control Switch Thermistor	
17	Abnormality of Remote Control Switch Inner Thermistor	
21	Abnormality of Outdoor Unit High Pressure Thermistor	Failure of Thermistor, Loose Terminal, Disconnected Wire.
22	Abnormality of Outdoor Ambient Thermistor	
23	Abnormality of Discharge Gas Thermistor	
24	Abnormality of Outdoor Unit Heat Exchanger Liquid Thermistor	
29	Abnormality of Outdoor Unit Low Pressure Thermistor	
31	Incorrect Capacity of Outdoor and Indoor Unit	Incorrect Setting of Capacity Combination or Incorrect O.U. Capacity Setting.
35	Incorrect Indoor Unit No. Setting	Duplication of Indoor Unit No.
36	Incorrect Combination of Indoor Units	Indoor Unit is J type (R22 Refrigerant)
38	Abnormality of Protective Circuit in Outdoor Unit	Failure of Protection Detecting Circuit
43	Low Pressure Ratio Protection	Failure of Compressor (Inverter Failure, Power Wire Falls Off)
44	Low Pressure Protection	Overload indoors in cooling, high outdoor temp. for hot room. Exp. v/v is locked at OPENING (connection falls off).
45	High Pressure Protection	Overload operation (block of heat exchanger), refrigerant piping clogs, excessive refrigerant, non-condensated gas mixed.
47	Activation of Low Pressure Decrease Protection Device	Shortage of Refrigerant, Clog of Ref. Piping, Locked Exp. v/v - Opening (connection falls off).
48	Over Load Current Protection for Inverter	Overload Operation or Failure of Compressor.
51	Abnormality of Current Sensor for Inverter	Failure of Current Sensor
53	Incorrect Sign of Inverter Sensor	Driving IC error signals checked (overcurrent, low voltage, shortcircuit protection).
54	Inverter Fin Temperature Increase	Abnormal Inverter Fin Thermistor, Clogging of Heat Exchanger Abnormal Outdoor Fan
55	IPM or PCB2 Abnormality	Failure of IPM or PCB2
57	Fan Motor Abnormality	Disconnected Wire or Incorrect Wiring between Control PCB and Inverter PCB. Incorrect Wiring or Fan Motor Abnormality
EE	Compressor Protection Alarm	The Alarm Codes 02, 07, 08, 39, 43-45, 47, Having an Impact on Compressor, Indicate 3 Times in 6 Hours.
b1	Incorrect Unit No. Setting	Over 64 I.U. Setting by Ref. No. or I.U. Address.
b2	Wrong Number of Indoor Units	Over 17 sets of indoor units in un-HI-NET II.



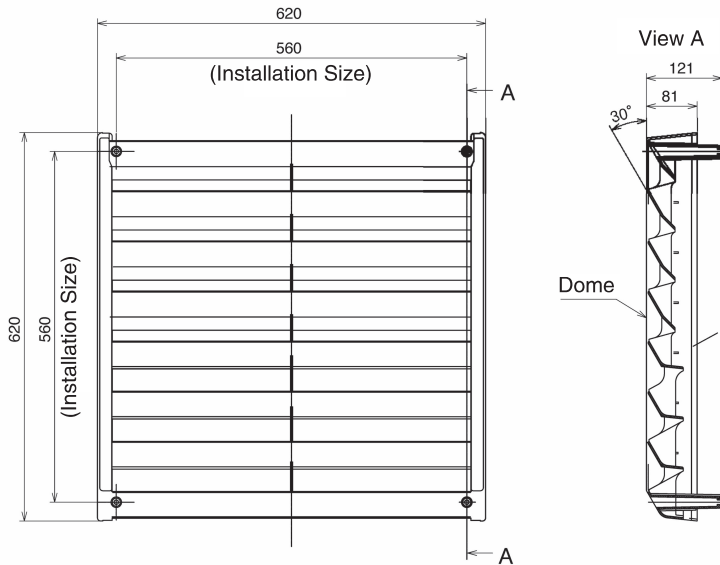
## 7. Accessories and Installation

### Dome, Wind Shield, Snow Shield

Accessories		Kbtu/h	Model
Dome		76-114	AG-335A X 2
Wind Shield			WSP-335A X 2
Snow Shield	Zinc-plated Steel Plate	76	Air Outlet
			Air Inlet-back
			Air Inlet-side
		96-114	Air Outlet
			Air Inlet-back
			Air Inlet-back
	Stainless Steel Sheet (SUS304)	76	Air Outlet
			Air Inlet-back
		96-114	Air Outlet
			Air Inlet-back



### 7.1 Dome



#### Specification

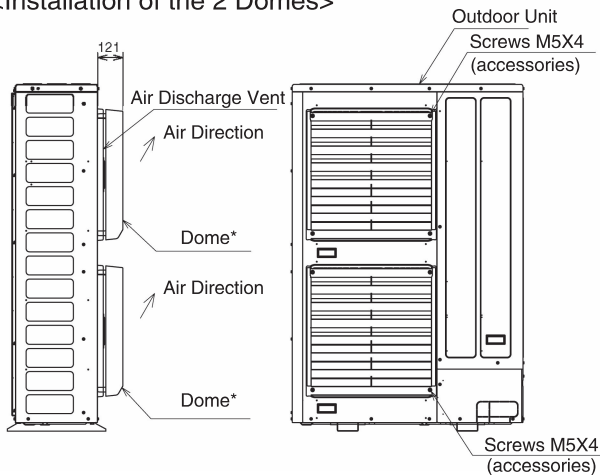
Type	AG-335A
QTY	2pcs/unit
Air discharge Direction	Upward, (downward), left and right side
Material	PP resin
Color	Grey
Weight	1.9kg
Accessories	Screws X4 (M5X20) installation
Installation Restriction	Cannot be used together with windshield, snow shield

#### Example of Dome Application

Fix the dome with 4 screws on the air discharge vent; fixing holes are in the 4 directions of the vent (Locking moment of screw: 2.4-3.1N·m).

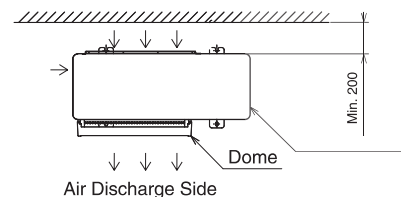
Do not remove the air discharge vent when installing the dome to avoid being hurt by the fan fin.

#### <Installation of the 2 Domes>



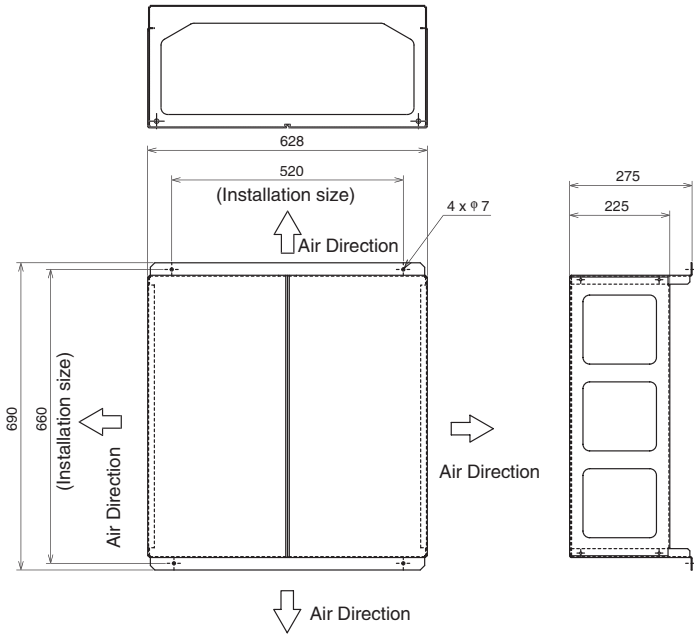
#### Working Space (Air-outlet Upwards)

1. There must be enough space to discharge on both sides.
2. Air can discharge downwards, so foundation under the unit should be built to ensure safe discharge space.
3. Air should discharge upwards when units are arranged in rows.



\*) : Keep air flows of two domes in the same direction

## 7.2 Wind-shield



### Specification

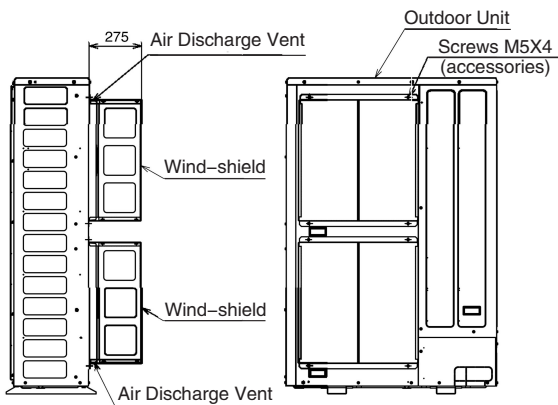
QTY	WSP-335A
Material	2Pcs/Unit
Color	Zinc-plated Steel+Enamel Paint
Weight	Grey(1.0Y8.5/0.5)
Accessories	5.5Kg
Installation	Fixed ScrewX4(M5X20)
Limitation	"Air Dome" or Snow Shield Can Not Be Installed With Wind-shield

### Example of Wind-shield Application

Fix the wind-shield with 4 screws (accessories) on the air discharge vent; fixing holes are in the 4 directions of the vent (Locking moment of screw: 2.4-3.1N·m).

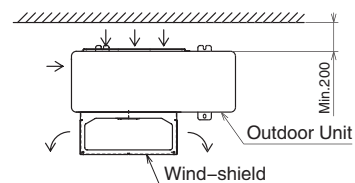
Do not remove the air discharge vent when installing the wind-shield to avoid being hurt by the fan fin.

### <2 Wind-shields Installation>



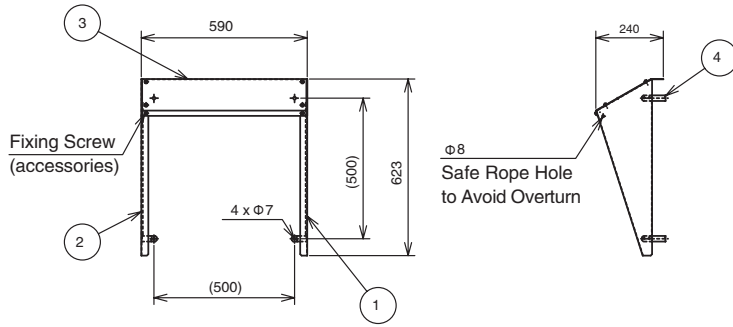
### Working space

1. Both sides of the outdoor unit are open space.
2. No obstacles at air discharge side.



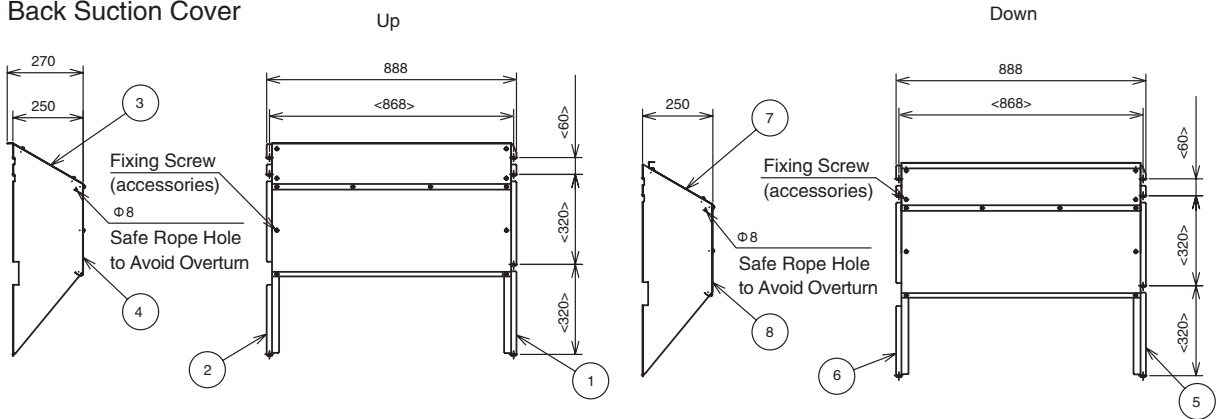
### 7.3 Snow-shield

#### Discharge Cover



No.	Part	Quantity
1	Right plate	1
2	Left plate	1
3	Front plate	1
4	Pillar	4

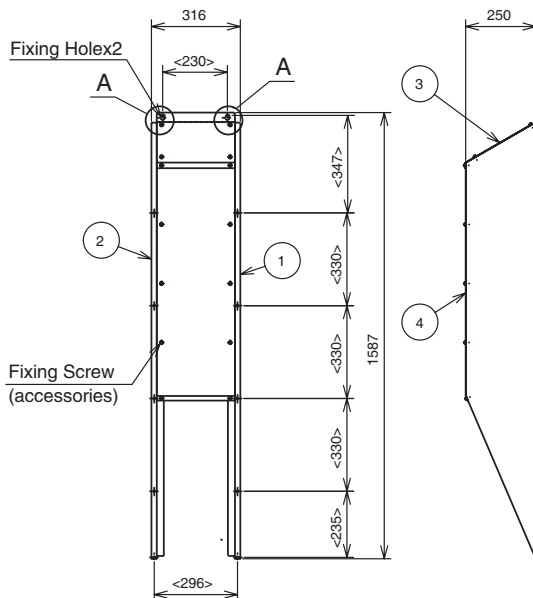
#### Back Suction Cover



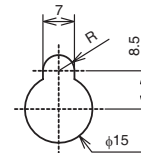
No.	Part Name	Quantity
1	Upper-right Plate	1
2	Upper-left Plate	1
3	Front-upper Plate	1
4	Front-lower Plate	1

No.	Part Name	Quantity
5	Lower-left Plate	1
6	Lower-right Plate	1
7	Front-upper Plate	1
8	Front-lower Plate	1

#### Left Suction Hood

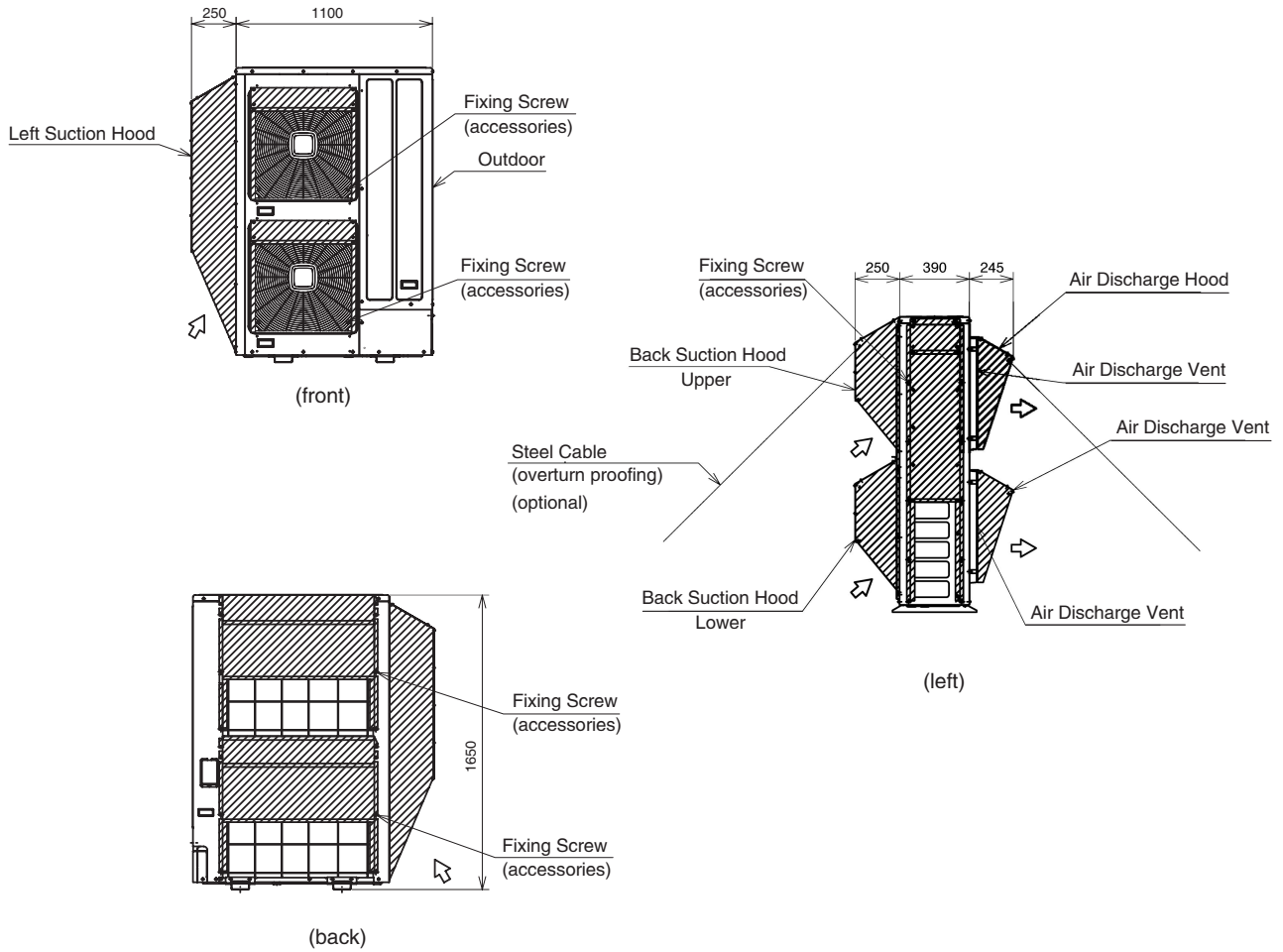


#### Enlarged A (fixing hole)



No.	Part Name	QTY
1	Side Plate-right	1
2	Side Plate-left	1
3	Front Plate-upper	1
4	Front Plate-lower	1

## Example of Snow-shield Application



## Snow-shield Specification

Part Name	Air Discharge Hood		Back Suction Hood		Left Suction Hood	
Model	ASG-NP335F	ASG-NP335FS	ASG-NP335B	ASG-NP335BS	ASG-NP335L	ASG-NP335LS
Quantity	2 Pcs/Unit		1 Pcs/Unit		1 Pcs/Unit	
Material	Zinc-plated Steel	Stainless Steel (SUS304)	Zinc-plated Steel	Stainless Steel (SUS304)	Zinc-plated Steel	Stainless Steel (SUS304)
Color	Gray(1.0Y8.5/0.5 or approx.)	-	Gray(1.0Y8.5/0.5 or approx.)	-	Gray(1.0Y8.5/0.5 or approx.)	-
Weight	3kg		14kg		8kg	
Installation	Field Installation					
Parts	Hood	Air Dischargex1		Back Suction x1 (upperx1, lower x1)		Left Suctionx1
	Screw	4(Self-tapping Screw M5x12)		10(Self-tapping Screw M5x12)		8(Self-tapping Screw M5x12)
	Screw (SUS)	6(Self-tapping Screw M5x12)	6(M5x14)	24(Self-tapping Screw M5x12)	24(M5x14)	14(Self-tapping Screw M5x12) 14(M5x14)
	Installation Guide					
Installation Limitation	Cannot Use with Dome or Wind-shield		Cannot Use with Wind-shield			
Overtum proofing cable (optional)	ASG-SW20A					

## 8. Test Run

### 8.1 Warning Items

Test run should be referred to table 8.2, and the record based on table 8.1.

## **WARNING**

- **Do not operate the system until all the check points have been cleared.**
  - a) **Check to ensure that the electrical resistance is more than 1 megohm, by measuring the resistance between ground and the terminal of the electrical parts. If not, do not operate the system until the electrical leakage is found and repaired.**
  - b) **Check to ensure that the stop valves of the outdoor unit are fully opened, and then start the system.**
  - c) **Check to ensure that switch on the main power source has been on for more than 12 hours, to warm the compressor oil by the oil heater.**
- **Pay attention to the following items while the system is running**
  - a) **Do not touch any of the parts by hand at the discharge gas side, since the compressor chamber and the pipes at the discharge side are heated higher than 90°C.**
  - b) **Do not push the button of the magnetic switch(es), it will cause a serious accident.**
- **Do not touch any electrical component after the main power is cut off within 3 minutes.**

Table 8.1 Test Run and Maintenance Record

MODEL:	SERIAL. No.	COMPRESSOR MFG. No.
CUSTOMER'S NAME AND ADDRESS:	DATE:	

1. Is the rotation direction of the indoor unit fan correct?
2. Is the rotation direction of the outdoor unit fan correct?
3. Are there any abnormal compressor sounds?
4. Has the unit been operated at least twenty (20) minutes?
5. Check Room Temperature
 

Inlet:	No. 1 DB /WB °C,	No. 2 DB /WB °C,	No.3 DB /WB °C,	No.4 DB /WB °C
Outlet:	DB /WB °C,	DB /WB °C,	DB /WB °C,	DB /WB °C
6. Check Outdoor Ambient Temperature
 

Inlet:	DB °C,	WB °C
Outlet:	DB °C,	WB °C
7. Check Refrigerant Temperature
 

Liquid Temperature:	_____ °C
Discharge Gas Temperature:	_____ °C
8. Check Pressure
 

Discharge Pressure:	_____ MPa
Suction Pressure:	_____ MPa
9. Check Voltage
 

Rated Voltage:	_____ V
Operating Voltage:	_____ V,
Starting Voltage:	_____ V
10. Check Compressor Input Running Current
 

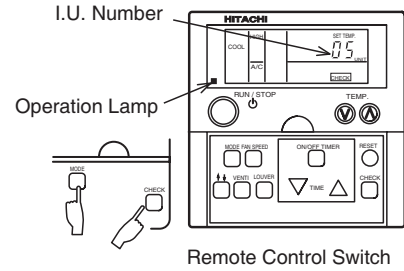
Input:	_____ kW
Running Current:	_____ A
11. Is the refrigerant charge adequate?
12. Do the operation control devices operate correctly?
13. Do the safety devices operate correctly?
14. Has the unit been checked for refrigerant leakage?
15. Is the unit clean inside and outside?
16. Are all cabinet panels fixed?
17. Are all cabinet panels free from rattles?
18. Is the filter clean?
19. Is the heat exchanger clean?
20. Are the stop valves open?
21. Does the drain water flow smoothly from the drain pipe?

## 8.2 Test Run Procedure by Wireless Remote Control Switch (HYXE-J01H)

**NOTE:** "TEST RUN" shall be performed with each refrigerant cycle (each outdoor unit).

- (1) Turn ON the power source of the units.  
 (2) Procedure for "TEST RUN" mode of remote control switch.  
 Depress the "MODE" and the "CHECK" switches together for more than 3 seconds.

- If "TEST RUN" and the counting number of the connected units with the remote control switch (for example "05") are indicated on the remote control switch, the connection of remote control cable is correct.  
 If no indication appears or the number of the units indicated is smaller than the actual number of the units, some abnormalities exist.



(3)


Remote Control Switch Indication	Wrong Portions	Inspection Points after the Power Source OFF
No Indication	<ul style="list-style-type: none"> <li>* The power source of outdoor unit is not turned ON.</li> <li>* The connection of the remote control cable is incorrect.</li> <li>* The connecting wires of power supply line are incorrect or loosed.</li> </ul>	<ol style="list-style-type: none"> <li>1. Connecting Points of Remote Control Cable Terminal Board of Remote Control Switch and Indoor Unit</li> <li>2. Contact of Terminals of Remote Control Cable</li> <li>3. Connecting Order of each Terminal Boards</li> <li>4. Screw Fastening of each Terminal Boards</li> </ol>
Counting number of connected units is incorrect.	<ul style="list-style-type: none"> <li>* The power source of outdoor unit is not turned ON.</li> <li>* The operating line wiring between indoor unit and outdoor unit is not connected.</li> </ul>	

Back to (1) after checking

- (4) Select TEST RUNNING MODE by depressing "MODE" switch. (COOL or HEAT)  
 (5) Depress "RUN/STOP" switch.

- The "TEST RUN" operation will be started. (The 2 hours OFF-TIMER will be set and the "TEST RUN" operation will be finished after 2 hours unit operation or by depressing the "RUN/STOP" switch again.)  
**NOTE:**  
 The "TEST RUN" operation ignores the temperature limitation and ambient temperature during heating operation to have a continuous operation, but the protections are alive.  
 Therefore, the protection may activate when the heating "TEST RUN" operation is performed in high ambient temperature.  
 If the units do not start or the operation lamp on the remote control switch is flashed, some abnormalities exist.

(6)

Remote Control Switch Indication	Unit Condition	Wrong Portions	Inspection Points after the Power Source OFF
The operation lamp flashes. (1 time/1 sec.) And the Unit No. and Alarm Code "03" flash.	The unit does not start.	The power source of outdoor unit is not turned ON. The connecting wires of operating line are incorrect or loosed.	<ol style="list-style-type: none"> <li>1. Connecting Order of each Terminal Boards</li> <li>2. Screw Fastening of each Terminal Boards</li> </ol> <b>NOTE:</b> Recovering method of FUSE for operating circuit. There is a fuse ("FUSE4" on Indoor Unit PCB1, "EF1" on Outdoor Unit PCB1) to protect operating circuit on the PCB, when the power lines are connected to operating lines. If fuse is melted, operating circuit can be recovered once by setting the dip switch on the PCB, as below. Indoor Unit PCB1 DSW7  * Set the switch #1 to ON position to recover the operation circuit.
The operation lamp flashes. (1 time/2 sec.)	The unit does not start.	Remote control cable is broken. Contact of connectors is not good. The connection of remote control cable is incorrect.	This is the same as items (3)-1 and 2.
Indication or flash except above.	The unit does not start, or starts once and then stops.	The connection of the thermistors or other connectors are incorrect. Tripping of protector exists, or elses.	Check by the abnormality mode table 8.3. (Do it by service people.)
The operation lamp flashes. (1 time/1 sec.) And the Unit No. <b>00</b> . Alarm Code <b>dd</b> and Unit Code <b>E.00</b> flash.	The unit does not start.	The connection of the remote control cable between indoor units is incorrect.	Check by the abnormality mode table 8.3. (Do it by service people.)

Back to (1) after checking

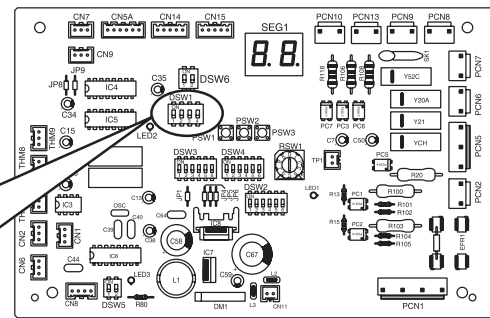
### 8.3 Test Run from Outdoor Unit Side

The procedure of test run from the outdoor unit side is indicated below. Setting of this dip switch is available with the power source ON.

#### Setting of Dip Switch (Before Shipment)

DSW1	
Switch for Setting of Service Operation and Function	
	<ol style="list-style-type: none"> <li>DSW1-1 : Cooling Test Run</li> <li>DSW1-1, 2 : Heating Test Run</li> <li>DSW1-1, 3 : Cooling Test Run in Transition Season</li> <li>DSW1-1, 2, 3: Heating Test Run in Transition Season</li> <li>DSW1-4 : Manual OFF of Compressor</li> </ol>

Outdoor Unit Printed Circuit Board (PCB1)



## ! WARNING

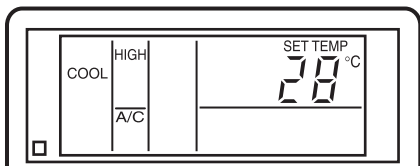
- Do not touch any other electrical parts when operating switches on the PCB.
- Do not attach or detach service cover when the power source for the outdoor unit is ON and the outdoor unit is operated.
- Turn all the dip switches of DSW1 OFF when the test run operation is completed.

	DIP Switch Setting	Operation	Remark
Test Run	1. Setting of Operation Mode (a) Cooling: Set DSW1-1 ON  (b) Heating: Set DSW1-1,2 ON  (c) Cooling in transition season: Set DSW1-1 and 3 ON  (d) Heating in transition season: Set DSW1-1, 2 and 3 ON 	<ol style="list-style-type: none"> <li>The indoor unit automatically starts to operate when the test run of the outdoor unit is set.</li> <li>The on/off operation can be performed from the remote control switch or DSW1 of the indoor unit.</li> <li>Continuous operation for 2 hours is performed without thermo-off.</li> </ol>	<ul style="list-style-type: none"> <li>Note: the runnings of indoor units keep pace with the test run of the outdoor unit.</li> <li>As for the test run from outdoor unit, the function of test run of remote control switch but outdoor unit is cancelled.</li> <li>All indoor units start test run at the same time when multiple indoor units share one remote controller, so never do test run after turning off the power of indoor units, when flashing of "TEST RUN" is not abnormal.</li> <li>Test run from remote controller, no DSW1 setting necessary.</li> </ul>
	2. DSW1-4 Set ON Manual Off of compressor 	<ol style="list-style-type: none"> <li>When DSW1-4 is turned on during compressor operation, the compressor stops immediately and the indoor unit is under the condition of thermo-off.</li> <li>When DSW1-4 is off, the compressor starts to operate after the cancellation of 3-minutes guard.</li> </ol>	<ul style="list-style-type: none"> <li>Do not repeat compressor on/off frequently.</li> </ul>

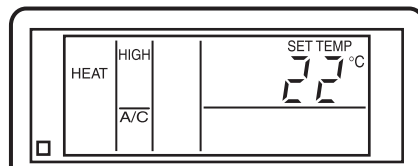


1) Following default display under Test Run

a) Cooling



b) Heating

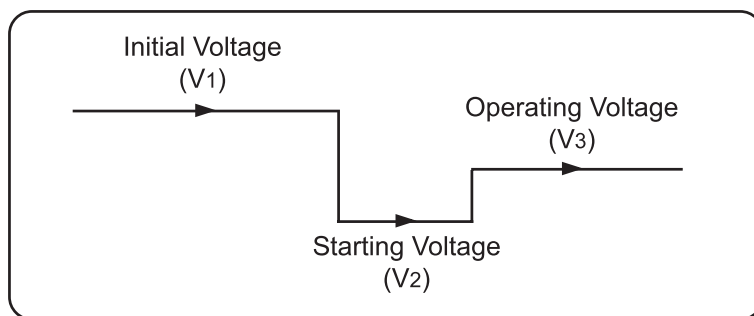


2) If the remote control switch is set to a different mode, the test run function will not start. In this case, perform the following actions before the test run.

- Remote control switch: stop
- Central station: stop and remote control switch is adjustable.

Do not change the remote control switch setting or the central station during the test run.

- 3) If an alarm code is indicated during the test run, reset the system by turning the main power supply off then back on.
- 4) Check to ensure that the indoor fan and the outdoor fan rotate correctly and that the air flow is smooth.
- 5) Check the power supply, if the power supply is abnormal, contact with electric power company. In general, voltage drop well occurs when starting as shown.



6) Check to ensure that the refrigerant charge is correct.

7) Check the safety devices.(high pressure switch)

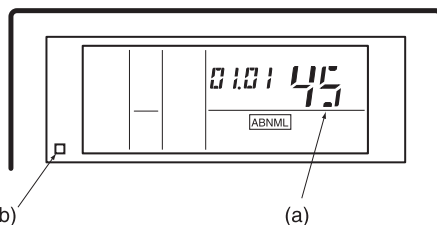
The high pressure of system will be increased under following situations:

The outdoor unit heat exchanger is covered in cooling	The air inlet of the indoor unit is covered in heating

When the high pressure retry control is activated, the outdoor unit PCB shows "P13". Alarm code 45 will be indicated when the code P13 indicates more than 3 times in an hour.

The remote control indicates as follows:


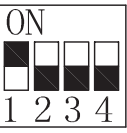
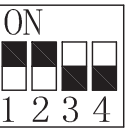
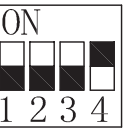
- a) Alarm code 45 indicated
- b) The operation lamp flashes.

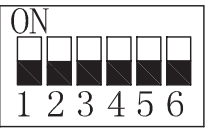


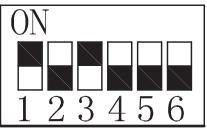
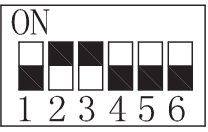
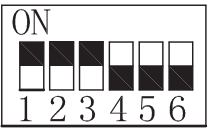
NOTE:

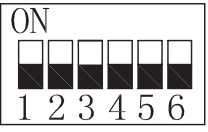
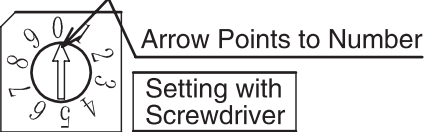
The high pressure could not be too high before the activation of the high pressure switch, based on temperature conditions.




### Outdoor Unit Switch Setting

DSW1	Test Run Service.1		
Setting of Outdoor Unit in Test Run			
Before Shipment	Test Run-cooling	Test Run-heating	Compressor Forced Stop
			
Always Keep No.3 at OFF.			

DSW2	Function & Input/Output Setting														
Before Shipment   Set Switches ON as Per the Right Table	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Setting Item</th> <th style="text-align: center;">No.</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">-</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">Piping Control Set</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">-</td> <td style="text-align: center;">3</td> </tr> <tr> <td style="text-align: center;">-</td> <td style="text-align: center;">4</td> </tr> <tr> <td style="text-align: center;">Function Setting</td> <td style="text-align: center;">5</td> </tr> <tr> <td style="text-align: center;">External Input/Output Setting</td> <td style="text-align: center;">6</td> </tr> </tbody> </table>	Setting Item	No.	-	1	Piping Control Set	2	-	3	-	4	Function Setting	5	External Input/Output Setting	6
Setting Item	No.														
-	1														
Piping Control Set	2														
-	3														
-	4														
Function Setting	5														
External Input/Output Setting	6														

DSW3	Capacity Setting of Outdoor Unit	
76 	96 	114 

DSW4	Ref. Cycle Setting (tens digit)	RSW1	Ref. Cycle Setting (single digit)
			
Ref. Cycle Ranges from 0-63			

DSW6	Setting of Piping Length		
Request Setting	Indoor Unit Is at Least 20m Higher than Outdoor Unit	Outdoor unit Is at Least 25m Higher than Indoor Unit	
Before Shipment			
			

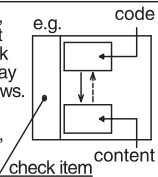
# (Keys to Check on 7-segment Display of O.U.Base Plate)

## How to enter Check mode

Press (PSW2) for 3 sec.

Press check s/w, EXT.input/output setting and check content will display as shown by arrows.

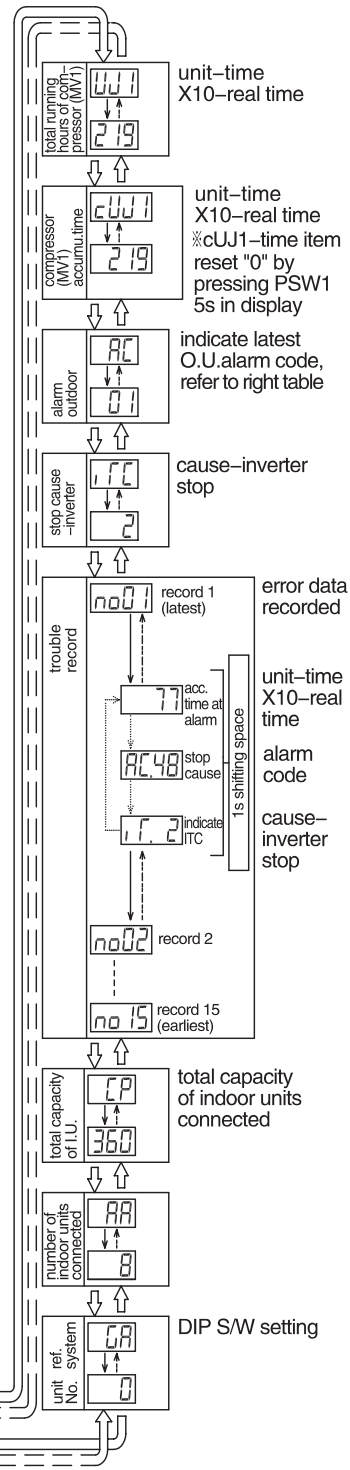
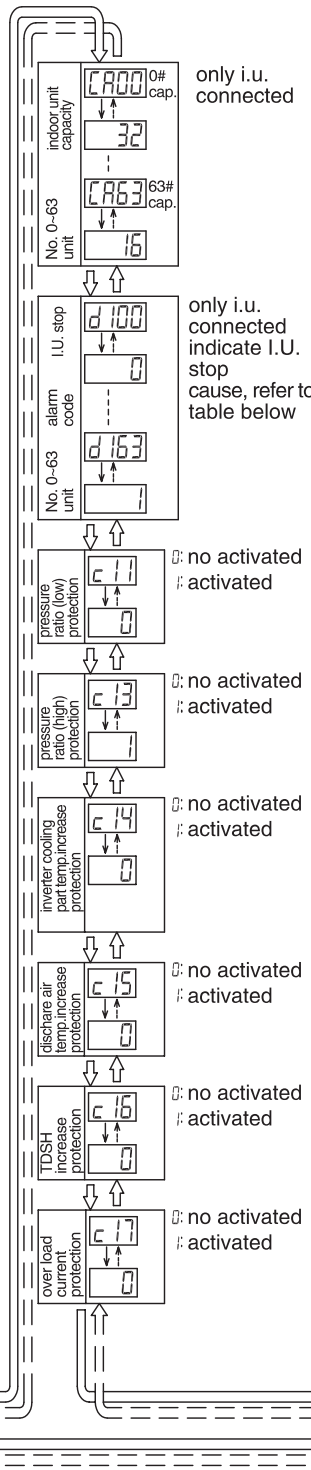
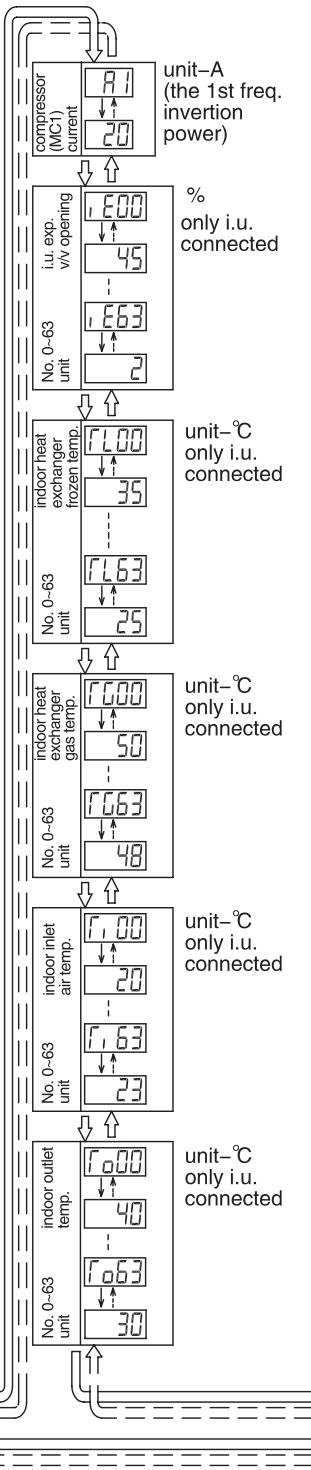
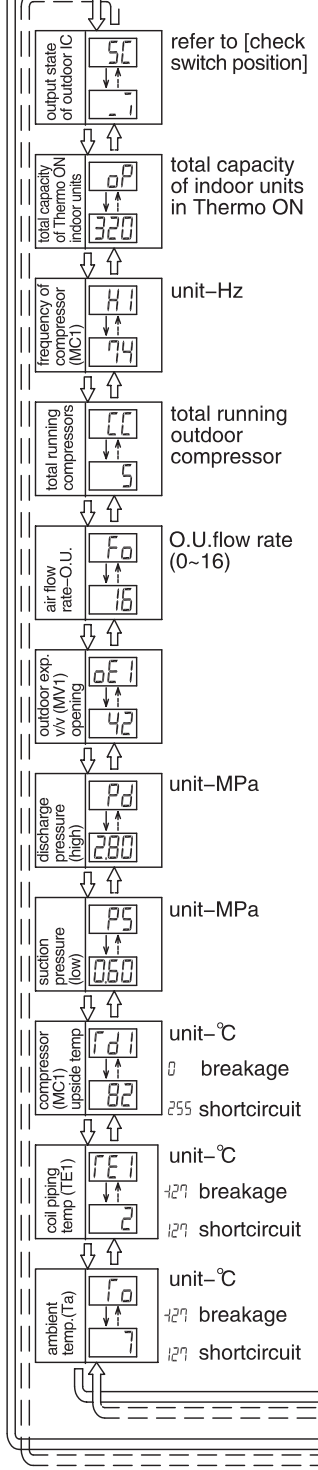
(PSW2—real line, PSW3—dashed)



## Check Release

Press (PSW2) for 3 Sec. Once More

**CAUTION**  
Be sure to release from point check after checking and return to normal status, or else the operation frequency of compressor might not be increased.




[Indoor Unit Stop Cause Code]

Code	Cause
0	RUN OFF, POWER OFF
1	Thermo OFF mode
2	Alarm
3	Prevention from frozen & over-increase
5	O.U.instant power failure reset
6	I.U.instant power failure reset
7	Cooling stop-low outdoor temp. Heating stop-high outdoor temp.
10	Request. force OFF
11	Pressure patio decrease protection activating
12	Low pressure increase protection activating
13	High pressure increase protection activating
15	Abnormal vacuum. high discharge protec. restart
16	Decrease in discharge gas super heat
17	Inverter stop/restart Details see inverter stop code Table
18	Low(high)voltage restart Other restarts of inverter Details see inverter stop code Table
19	Exp.v/v opening change prevention restart
21	Forced Thermo OFF
22	Forced Thermo OFF(heat start control: Crankcase heater in preheating) Release method refers to the right
26	High pressure increase protection activating
27	O.U.fan motor protector restart
28	Stop unit via air outlet of cold room

[Inverter Stop Code]

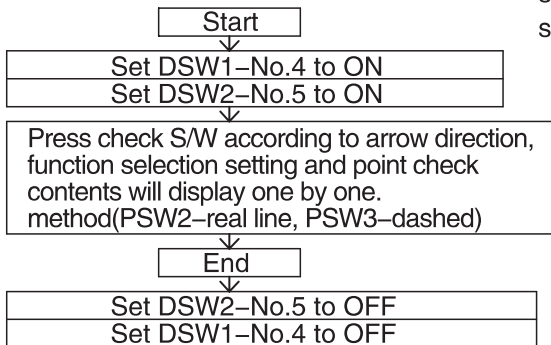
Code	Cause
1	Drive IC error
2	Instant overload current
3	High temp.of radiation fin
4	Electric overheat activate (overload current inverter)
5	Lower voltage
6	Overload voltage
7	Abnormal inverter transs.
8	Current check abnormal
9	Instant current loss check
11	Inverter micro-pc reset
12	Wrong compressor ground wiring
13	Phase shortage
16	No action of inverter

[release of FORCE Thermo OFF]  
Press (PSW1) for 3s to release  
Thermo OFF, which would damage  
compressor, don't use it if  
unnecessary!

Note: Not all stops in alarming indicate 

# Function Selection Setting Methods

Function selection setting must be done in stop; setting in running, Check mode, external output setting is impossible.



Note: record the function setting based on function code. This is the example of setting "1".

e.g.  
SET 1

	SEG2	SEG1	
Heating Thermo OFF Fan Run at Times	FA	0	Not Available
SET		↓ PSW1	Available
Night-shift	n	0	Not Available
SET		↓ PSW1	Available
Heating-ambient Temp. Restriction Cancellation	CH	0	Not Available
SET		↓ PSW1	Available
Cooling-ambient Temp. Restriction Cancellation	CC	0	Not Available
SET		↓ PSW1	Available
Change of Defrost Condition	Ca	0	Not Available
SET		↓ PSW1	Available
Slow Defrost Setting	bu	0	Not Available
SET		↓ PSW1	Available
Outdoor Hotstart Control Cancellation	Hf	0	Not Available
SET		↓ PSW1	Available
Cooling Capacity Priority	cu	0	Not Available
SET		↓ PSW1	Available
Heating Capacity Priority	Hu	0	Not Available
SET		↓ PSW1	Available

Reserved (no function)	Sc	0	Not Available
SET		↓ PSW1	Available
Reserved (no function)	SH	0	Not Available
SET		↓ PSW1	Available
Long Piping Correction	nH	0	Not Available
SET		↓ PSW1	Available
Low Noise Setting	db	0	Not Available
SET		↓ PSW1	Available
Fixing of Demand Function	de	0	Not Available
SET		↓ PSW1	Available
Net Function Effect	UE	0	Not Available
SET		↓ PSW1	Available
Low Cooling Temp Prevention 1	Fb	0	Not Available
SET		↓ PSW1	Available
Low Cooling Temp Prevention 2	Fc	0	Not Available
SET		↓ PSW1	Available
Reserved (no function)	F1	0	Not Available
SET		↓ PSW1	Available

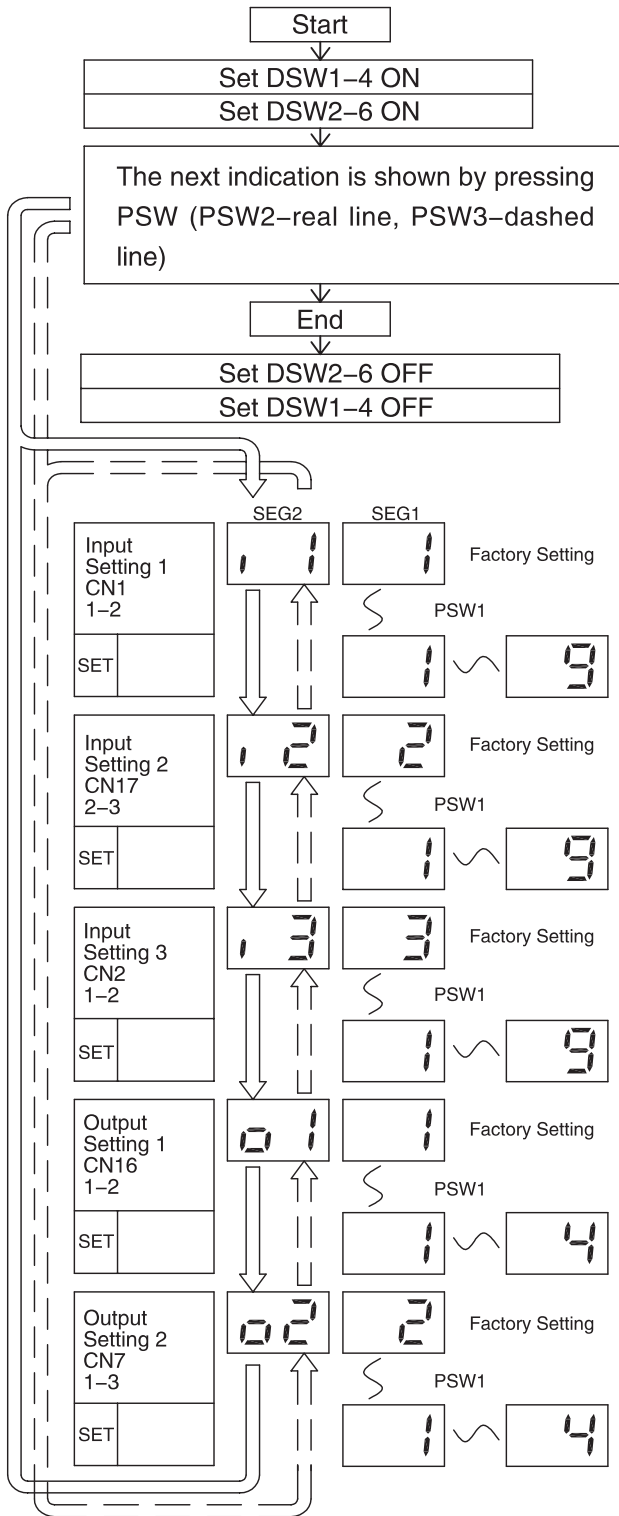
## External Input/Output Setting

External input/output setting must be done in STOP, cannot be done in RUN, Check, and external output setting.

NOTE 1: Record the external input/output setting based on function No.  
Example is the case of setting 1.

e.g.  
SET 1

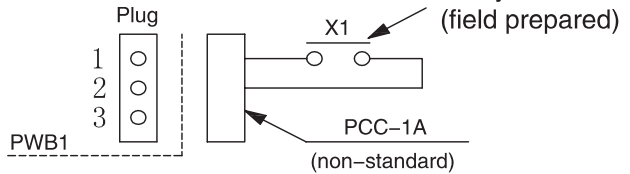
NOTE 2: Do not set same function for different input terminals, or else the settings of the terminal with larger number is invalid.  
(e.g. if input 1 and 2 are set with same function, the input 2 is invalid.)



### Setting Contents

SEG1	Input	Output
1	Fixed Heating Mode	Operation Signal
2	Fixed Cooling Mode	Alarm Signal
3	Request Stops	Compressor ON Signal
4	Outdoor Fan RUN/STOP	Defrost Signal
5	Force to Stop	-
6	Request Current Control 60%	-
7	Request Current Control 70%	-
8	Request Current Control 80%	-
9	Request Current Control 100%	-

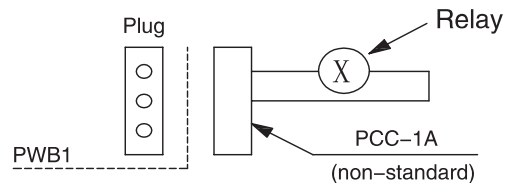
#### Wiring Example (Input)



#### Relay Connecting Sample

Relay Sample	Reference
OMRON MiniPower Spec. MY1F (or 2F) or Substitute	100V or 200V

#### Wiring Example (Output)



#### Relay Connecting Sample

Relay Sample
OMRON MiniPower Spec. LY2F DC12V

## 9. Safety and Control Device Setting

- Compressor Protection  
High pressure switch: this switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.
- Fan Motor Protection  
When temp. reaches setting, output of motor will stop; reversely, the restriction will be cancelled when temp. falls below setting.
- Suction and discharge curves in different working conditions

### 1. AVW-76UE(7)(9)SR

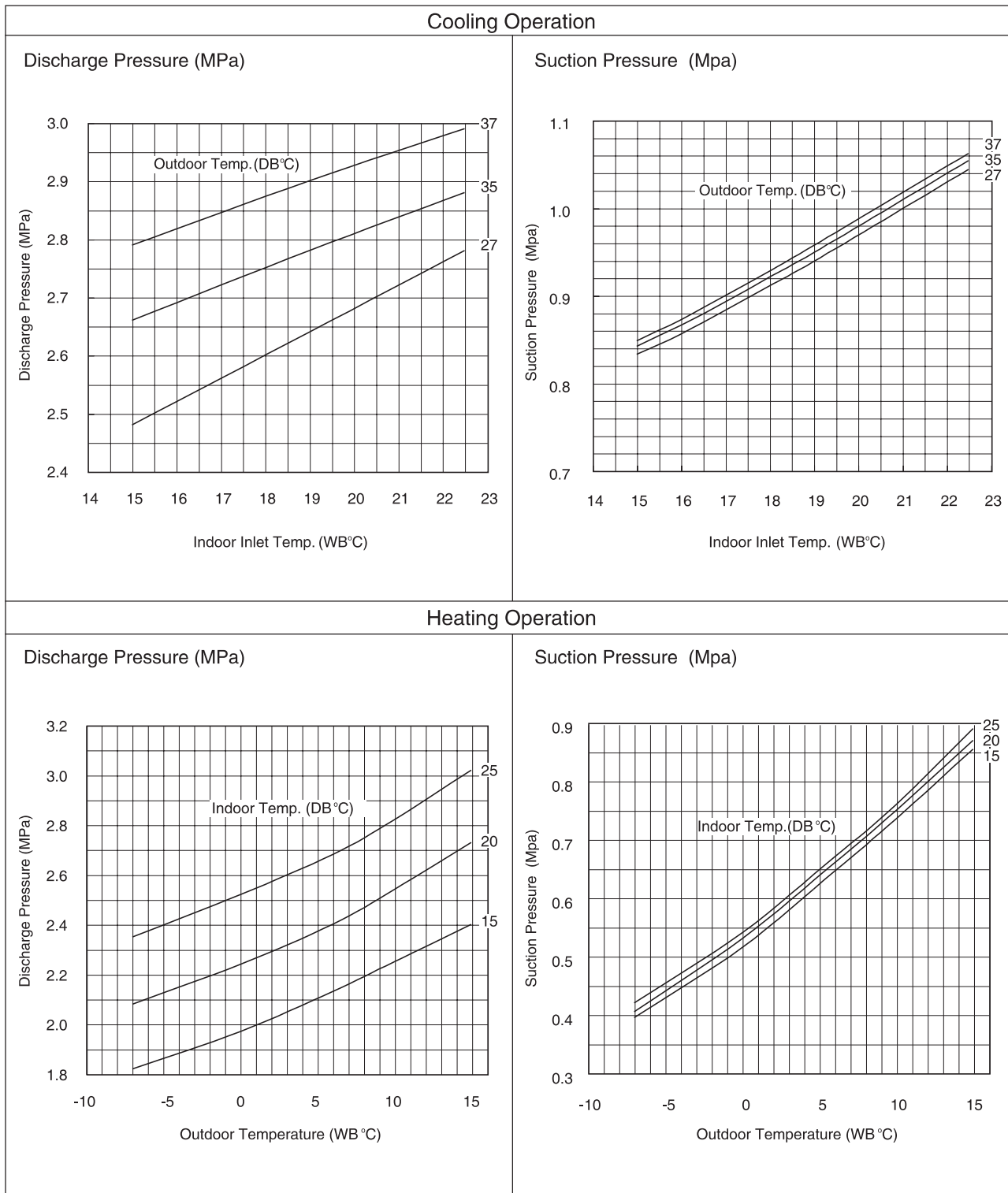


Fig. 9.1 Normal Working Pressure

2. AVW-96UE(7)(9)SR

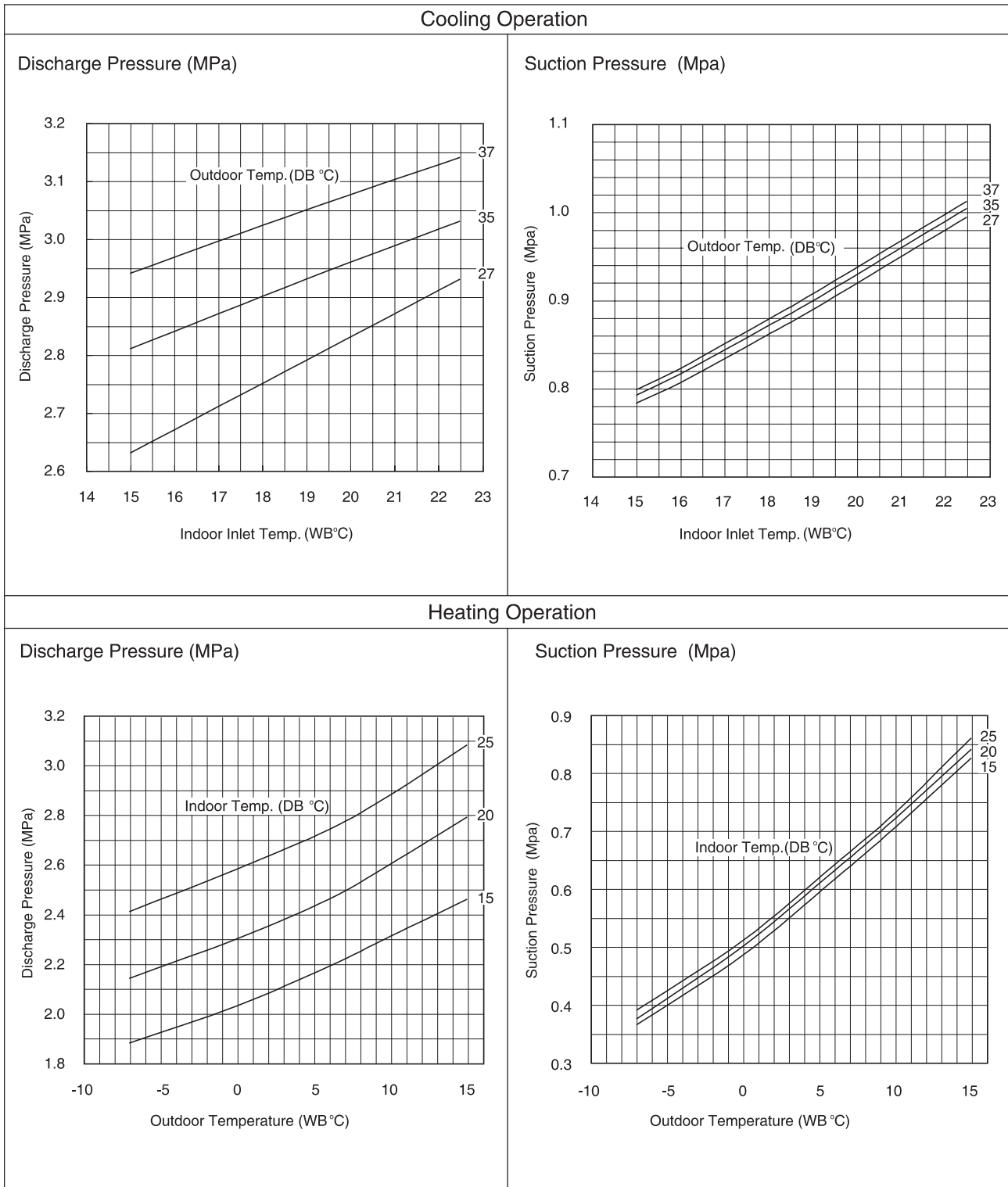


Fig. 9.2 Normal Working Pressure



3. AVW-114UE(7)(9)SR

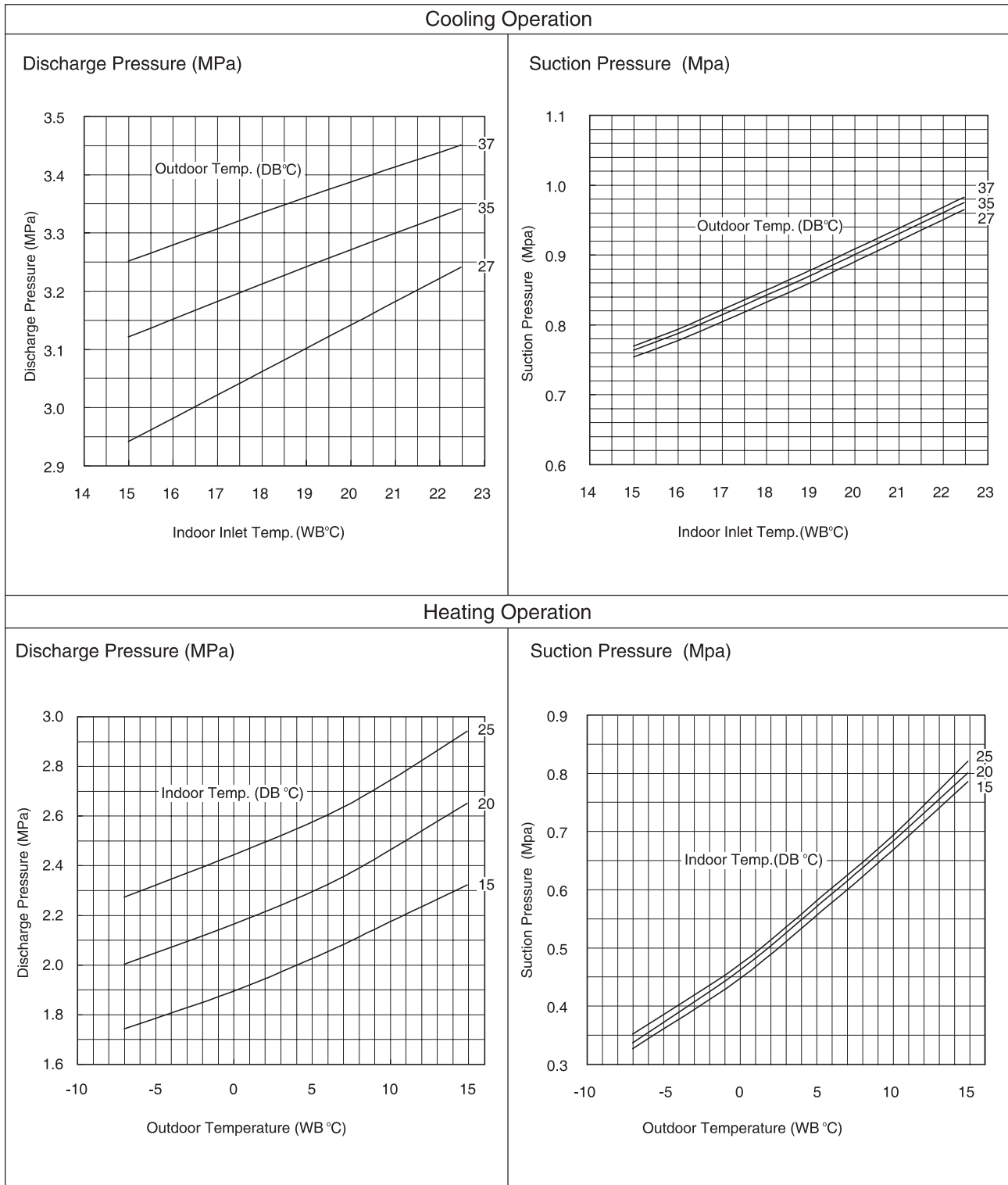


Fig. 9.3 Normal Working Pressure

NOTE:

- The pressure curves indicated above is tested under the following conditions.  
 Indoor fan speed: high  
 Indoor total capacity: 100% combination with the capacity of the outdoor unit. (4 indoor units connected)  
 Piping length: 7.5m (main pipe: 5m, branch: 2.5mx4)
- Do not use the above data for the refrigerant charge procedure.  
 These data should be used as a reference for the checking of operating conditions.

# **Maintenance and Service**

# Contents

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# 1. Maintenance

## 1.1 Regular Inspection

In order to ensure the operation reliability and prolong the service life, please pay attention to the following additional items.

### 1) For Indoor Unit and Outdoor Unit

#### a) Fan and Fan Motor

- Lubrication – All fan motors are pre-lubricated and sealed at the factory. Therefore, no lubricating maintenance is required.
- Sound and Vibration – Inspect for abnormal sound and vibration.
- Rotation – Inspect for rotation and rotating speed. It should clockwise rotate and check the rotary speed.
- Insulation – Inspect for electrical insulation resistance.

#### b) Heat Exchanger

- Clogging – Inspect and remove any accumulated dirt and dust from the heat exchanger at regular intervals. As for outdoor unit, other obstacles such as growing lawn and paper, which might restrict air flow, should also be removed.

#### c) Piping Connection

- Leakage – Inspect for refrigerant leakage at piping connection.

#### d) Cabinet

- Stain and Lubrication – Inspect and remove any stain and lubrication.
- Fixing Screw – Inspect and fix loosened or lost screws.
- Insulation – Inspect and repair peeled thermal insulation material on cabinet.

#### e) Electrical Equipment

- Activation – Inspect for abnormal activation of the AC contactor, auxiliary relay, PCB and etc.
- Line Condition – Pay attention to working voltage, amperage and phase balance. Inspect for faulty contact caused by loosened terminal connections, oxidized contacts, foreign matter, and other items. Inspect for electrical insulation resistance.

#### f) Control and Protective Devices

- Setting – Do not readjust the setting in the field unless the setting is maintained at a point other than the point listed in “SAFETY AND CONTROL DEVICE SETTING” .

### 2) For Indoor Unit

#### a) Air Filter

- Cleaning – Inspect and remove any accumulated dirt and dust according to “Filter Cleaning” .

#### b) Drain Pan, Drain-up Mechanism and Drain Pipe

- Drain Line – Inspect and clean the condensate drain line at least twice a year.
- Drain-up Mechanism – Inspect for activation of drain-up mechanism.

#### c) Float Switch

- Activation – Inspect for activation of float switch.

### 3) For Outdoor Unit

#### a) Compressor

- Sound and Vibration – Inspect for abnormal sound and vibration.
- Activation – Inspect for that the voltage drop of power supply line is within 16% at start and within 2% during operation.

#### b) Reverse Valve

- Activation – Inspect for any abnormal activation sound.

#### c) Strainer

- Clogging – Inspect for that no temperature difference between both ends.

#### d) Earth Wire

- Earth Wire – Inspect for continuity to the earth.

#### e) Oil Heater

- Activation – The oil heater should be activated at least 12 hours before start-up, by switching ON the main power source.

### 4) For Remote Control Switch

- Switch and Indication – Inspect for activation of switch

## 1.2 Filter Cleaning

### **⚠ CAUTION**

Do not operate the system without the air filter to protect the indoor unit heat exchanger against being clogged.

Turn OFF the main power switch before taking out the filter.

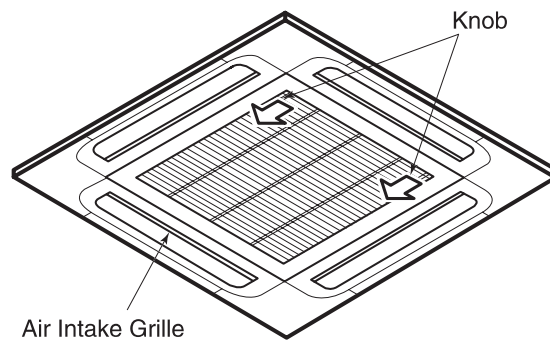
#### 1.2.1 Take Out the Filter

##### 1) 4-Way Cassette Type

The indication, "FILTER" is shown on the display of the remote control switch after approximately 1,200 hour operation. Take out the air filter according to the following steps.

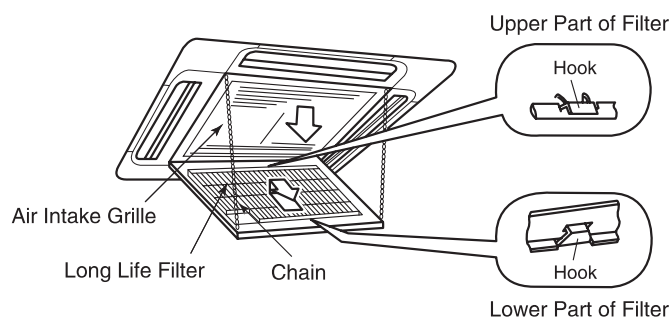
##### Step 1:

Open the air intake grille after pushing the two knobs toward the arrow mark as shown in the figure below.



##### Step 2:

Take out the air filter from the air intake grille by supporting the air grille and lifting the air filter after detaching the filter from two hinges.



For other indoor units, please refer to the related information of HI-FLEXI M Series manual.

## 2. Troubleshooting

### 2.1 Initial Troubleshooting

#### 2.1.1 This is Not Abnormal

1) Smells from Indoor Unit

Smell adheres on indoor unit after a long period of time. Clean the air filter and panels or allow a good ventilation.

2) Sound from Deforming Parts

During system starting or stopping, an abrading sound might be heard. However, this is due to thermal deformation of plastic parts. It is not abnormal.

3) Steam from Outdoor Heat Exchanger

During defrosting operation, ice on the outdoor heat exchanger is melted, resulting in making steam.

4) Dew on Air Panel

When the cooling operation continues for a long period of time under high humidity conditions (higher than 27°C DB/80% R.H), dew can form on the air panel.

5) Refrigerant Flow Sound

While the system is being started or stopped, sound from the refrigerant flow may be heard.

#### 2.1.2 Not Cooling or Heating Well

- Check for obstruction of air flow of the outside or inside units.
- Check if too much heat source exists in the room.
- Check if the air filter is clogged with dust.
- Check to see if the doors or windows are opened or not.
- Check if the temperature condition is not within the operation range.

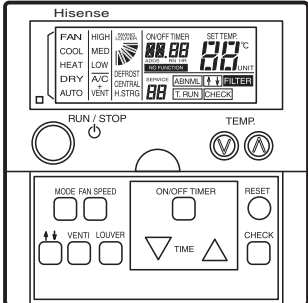
#### 2.1.3 Not Operated

- Check for electrical wiring.
- Check for DIP switch setting.
- Check whether the “SET TEMP” is set at the correct temperature.
- In the case that “RUN” lamp on remote control switch is flickering every 2 seconds, refer to “Service Manual” because abnormality of some device is suspected.

### 2.2 Troubleshooting by Alarm Code

The Alarm Codes shown below are indicated when a fault occurs during operation.

CAUTION: Before servicing electric parts, cut off power supply completely.

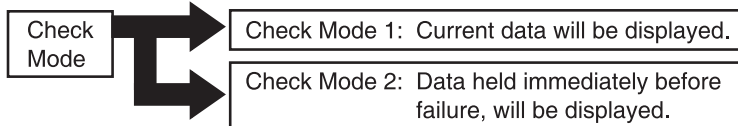
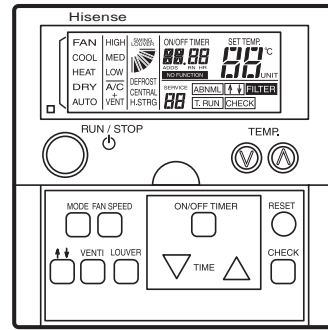
Indication	Trouble	Possible Causes	Action																																
RUN lamp flashes for 2 seconds.	Failure inTransmission between Indoor Unit and Remote Control Switch	Remote Control Cable BrokenContact Failure in Remote Control Cable IC or Microcomputer Defective	Locate the cause and repair. Check by remote control self-checking function. (See Service Manual.)																																
RUN lamp flashes 5 times (5 seconds) with unit number and alarm code displayed.	“Failure”	<p>Indication of Unit Number in Remote Control Switch</p> <table border="1"> <thead> <tr> <th>Unit No.0</th> <th>Unit No.1</th> <th>Unit No.2</th> <th>Unit No.3</th> <th>Unit No.4</th> <th>Unit No.5</th> <th>Unit No.6</th> <th>Unit No.7</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>01</td> <td>02</td> <td>03</td> <td>04</td> <td>05</td> <td>06</td> <td>07</td> </tr> <tr> <th>Unit No.8</th> <th>Unit No.9</th> <th>Unit No.10</th> <th>Unit No.11</th> <th>Unit No.12</th> <th>Unit No.13</th> <th>Unit No.14</th> <th>Unit No.15</th> </tr> <tr> <td>08</td> <td>09</td> <td>10</td> <td>11</td> <td>12</td> <td>13</td> <td>14</td> <td>15</td> </tr> </tbody> </table> <p>NOTE: Alarm code is also indicated on 7-segment display on outdoor unit PCB1, if a trouble occurs.</p>	Unit No.0	Unit No.1	Unit No.2	Unit No.3	Unit No.4	Unit No.5	Unit No.6	Unit No.7	00	01	02	03	04	05	06	07	Unit No.8	Unit No.9	Unit No.10	Unit No.11	Unit No.12	Unit No.13	Unit No.14	Unit No.15	08	09	10	11	12	13	14	15	<p>Remote Control Switch</p>  <p>Unit No.3</p> <p>Alarm Code of "Outdoor Unit Protection Activated"</p>
Unit No.0	Unit No.1	Unit No.2	Unit No.3	Unit No.4	Unit No.5	Unit No.6	Unit No.7																												
00	01	02	03	04	05	06	07																												
Unit No.8	Unit No.9	Unit No.10	Unit No.11	Unit No.12	Unit No.13	Unit No.14	Unit No.15																												
08	09	10	11	12	13	14	15																												

## Alarm Code

Code No.	Content of Abnormality	Leading Cause
01	Activating of Protection Device	High Water Level in Drain Pan, Activated Float Switch.
02	Activating of Protection Device (High Pressure Switch Off)	Refrigerant Pipe Blocked, too much Refrigerant, Not Condensed Gas.
03	Abnormality between Indoor and Outdoor	Incorrect Wiring, Loose Terminals, Disconnected wire, Tripping of Fuse.
05	Abnormality of Power Supply Phases	Abnormal Waveform of one or more the Supply Phases (Ex. Distortion of the Voltage Signal).
06	Voltage Drop by Excessively Low or High Voltage to Outdoor Unit	Voltage Drop of Power Supply Insufficient Capacity of Power Supply Wiring.
07	Decrease of Discharge Gas Superheat	Excessive Refrigerant Charged, Locked Opening of Exp. v/v (Connection Break), Failure of Refrigerant and Electrical Wiring Between I.U. and O.U.
08	Increase of Discharge Gas Temperature	Insufficient Refrigerant, Clogging of Ref. Piping, Locked Opening of Exp. v/v (Connection Breaks), Failure of Refrigerant and Electrical Wiring between I.U. and O.U.
09	Tripping of Protection Device of Outdoor Fan Motor	Overheat of Outdoor Fan Motor, Locked.
11	Abnormality of Indoor Unit Inlet Air Thermistor	Failure of Thermistor, Loose Terminal, Disconnected Wire.
12	Abnormality of Indoor Unit Outlet Air Thermistor	
13	Freeze Protection Thermistor	
14	Abnormality of Indoor Unit Heat Exchanger Thermistor	
16	Abnormality of Remote Control Switch Thermistor	
17	Abnormality of Remote Control Switch Inner Thermistor	
21	Abnormality of Outdoor Unit High Pressure Thermistor	Failure of Thermistor, Loose Terminal, Disconnected Wire.
22	Abnormality of Outdoor Ambient Thermistor	
23	Abnormality of Discharge Gas Thermistor	
24	Abnormality of Outdoor Unit Heat Exchanger Liquid Thermistor	
29	Abnormality of Outdoor Unit Low Pressure Thermistor	
31	Incorrect Capacity of Outdoor and Indoor Unit	Incorrect Setting of Capacity Combination or Incorrect O.U. Capacity Setting.
35	Incorrect Indoor Unit No. Setting	Duplication of Indoor Unit No.
36	Incorrect Combination of Indoor Units	Indoor Unit is J type (R22 Refrigerant)
38	Abnormality of Protective Circuit in Outdoor Unit	Failure of Protection Detecting Circuit
43	Low Pressure Ratio Protection	Failure of Compressor (Inverter Failure, Power Wire Falls Off)
44	Low Pressure Protection	Overload indoors in cooling, high outdoor temp. for hot room. Exp. v/v is locked at OPENING (connection falls off).
45	High Pressure Protection	Overload operation (block of heat exchanger), refrigerant piping clogs, excessive refrigerant, non-condensated gas mixed.
47	Activation of Low Pressure Decrease Protection Device	Shortage of Refrigerant, Clog of Ref. Piping, Locked Exp. v/v - Opening (connection falls off).
48	Over Load Current Protection for Inverter	Overload Operation or Failure of Compressor.
51	Abnormality of Current Sensor for Inverter	Failure of Current Sensor
53	Incorrect Sign of Inverter Sensor	Driving IC error signals checked (overcurrent, low voltage, shortcircuit protection).
54	Inverter Fin Temperature Increase	Abnormal Inverter Fin Thermistor, Clogging of Heat Exchanger Abnormal Outdoor Fan
55	IPM or PCB2 Abnormality	Failure of IPM or PCB2
57	Fan Motor Abnormality	Disconnected Wire or Incorrect Wiring between Control PCB and Inverter PCB. Incorrect Wiring or Fan Motor Abnormality
EE	Compressor Protection Alarm	The Alarm Codes 02, 07, 08, 39, 43-45, 47, Having an Impact on Compressor, Indicate 3 Times in 6 Hours.
b1	Incorrect Unit No. Setting	Over 64 I.U. Setting by Ref. No. or I.U. Address.
b2	Wrong Number of Indoor Units	Over 17 sets of indoor units in un-HI - NET II.

## 2.3 Troubleshooting in Check Mode

- Use the remote control CHECK switch in the following cases.
  - (1) When the RUN lamp is flashing.
  - (2) To trace back the cause of trouble after restarting from stoppage with the RUN lamp flashing.
  - (3) To check during normal operation or stoppage.
  - (4) To monitor the temperatures of intake and discharge air.

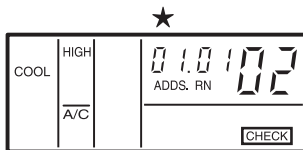


Normal Mode

CHECK  Press for more than 3 seconds.

- Indication will delay as transmission between the remote control switch and indoor unit takes about 10 seconds.
- All data may be displayed as "FF" or "-1". These transient data produced temporarily by software do not affect device functions at all. (The alarm code may also be indicated as "FF".)

Unit Number and Alarm Code Displayed

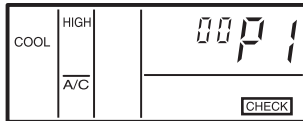
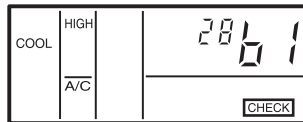


- Alarm code identifying the last fault that has occurred in the indicated unit.
- Unit number of connected unit or unit number for which checking mode was selected previously.

(A) Perform within 7 seconds to check another unit.

- Forward: Press the ^ switch to rise from 00 to 01 to 02 ...
- Backward: Press the v switch to descend from 15 to 14 to 13 ...

Check Mode 1 (See 2.3.1 for details.)



CHECK  Press for more than 3 seconds.

To View the Previous Indication TEMP

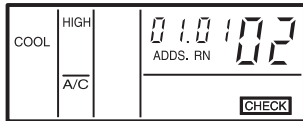


To View the Next Indication TEMP



Press ^ to view the next data.  
Press v to view the previous data.

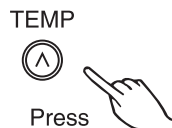
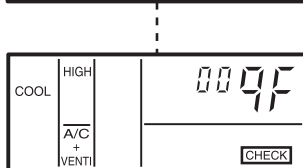
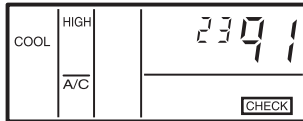
Unit Number and Alarm Code Displayed



See (A)

After 7 seconds

Check Mode 2 (See 2.3.2 for details.)



★ ADDS: Number of Indoor Unit in No. \*\* Cycle RN: No. \*\* Refrigerant Cycle

- In Check Mode 2, Data of the first three units connected serially to a remote control switch are available.
- You can press the CHECK switch to release Check Mode 2. Check Mode 1 cannot be released even if you press the CHECK switch.

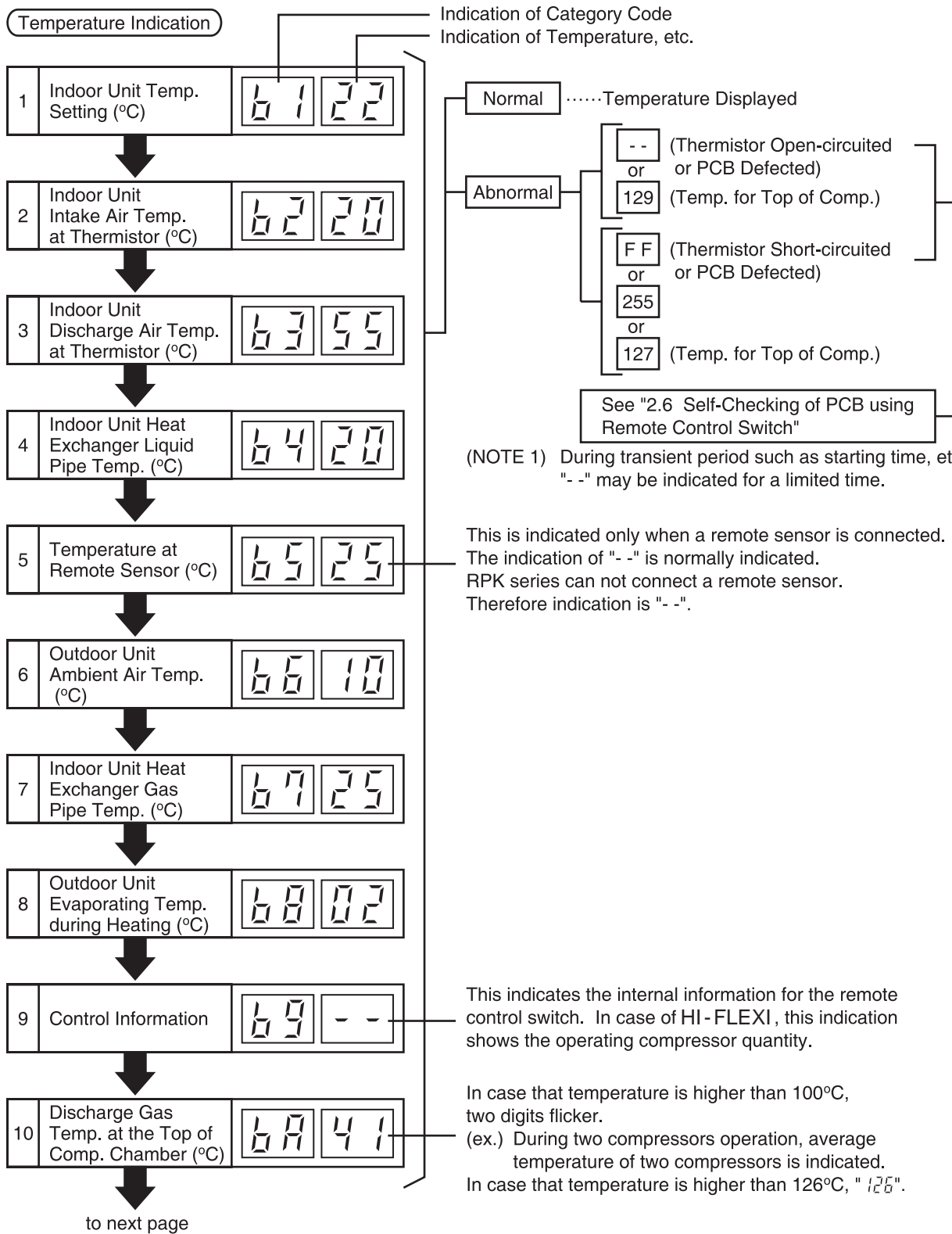
Check Mode Released

CHECK  Press



2.3.1 Contents of Check Mode 1

Pressing the “^” part of “TEMP” can show the next display. If the “v” part of “TEMP” is pressed, the former display will show.

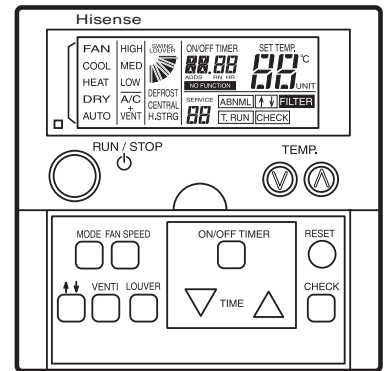
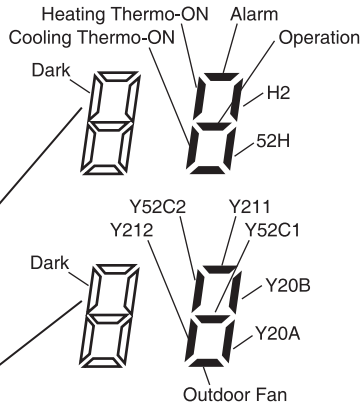


11 Thermo Temp. of Remote Control Switch 66 23

Indication on Micro-Computer Input/Output

12 Micro-Computer Input/Output in Indoor Unit E1 4

13 Micro-Computer Input/Output in Outdoor Unit E2 -



Symbols with a letter Y are relays on PCB

Indication of Unit Stoppage Cause

14 Cause of Stoppage d1 01

Abnormality Occurrence Counter

15 Abnormality Occurrence Times E1 01

16 Instantaneous Power Failure Occurrence Times in Indoor Unit E2 00

17 Transmission Error Occurrence Times between Remote Control Switch and Indoor Unit E3 00

18 Abnormality Occurrence Times on Inverter E4 00

Indication of Automatic Louver Condition

19 Louver Sensor F1 00

[I.U. Stop Cause Code]

Code	Causes
0	Operation OFF, Power OFF
1	Thermo-OFF (NOTE 1), Activating Float Switch
2	Alarm (NOTE 2)
3	Freeze Protection, Overheating Protection
5	Instantaneous Power Failure at Outdoor Unit, Reset (NOTE 3)
6	Instantaneous Power Failure at Indoor Unit, Reset (NOTE 4)
7	Stoppage of Cooling Operation due to Low Outdoor Air Temperature, Stoppage of Heating Operation due to High Outdoor Air Temperature
10	Demand, Enforced Stoppage
11	Retry due to Pressure Ratio Decrease
12	Retry due to Low Pressure Increase
13	Retry due to High Pressure Increase
15	Retry due to Abnormal High Temperature of Discharge Gas, Excessively Low Suction Pressure
16	Retry due to Decrease of Discharge Gas Superheat
17	Retry due to Inverter Tripping, Details See Inverter Stop Code Tab.
18	Retry due to Lower(Higher) Voltage, Other Retry due to Inverter, Details See Inverter Stop Code Tab.
19	Expansion Valve Opening Change Protection
20	Operation Mode Changeover of Indoor Unit (NOTE 5)
21	Force Thermo OFF
22	Force Thermo OFF(Heat Start Control: Crankcase Heater in Preheating) Release Method Refers to the Right
26	Restart from Lower High Pressure
27	O.U.Fan Motor Protector Restart
28	Stop Unit via Air Outlet of Cold Room

[Inverter Stop Codes]

Code	Causes
1	Drive Ic Error
2	Instant Overload Current
3	High Temp. of Fin
4	Electric Overheat Activate (Overload Current Inverter)
5	Lower Voltage
6	Higher Voltage
7	Abnormal Inverter Transs.
8	Current Check Abnormal
9	Instant Current Loss Check
11	Inverter Micro-PC Restart
12	Wrong Compressor Ground Wiring
13	Phase Shortage
16	No Action of Inverter

[Release of FORCE Thermo OFF]  
Press (PSW1)3S to release Thermo OFF, which would damage compressor, don't use it if unnecessary!

- (NOTE 1) Explanation of Term,  
Thermo-ON: A condition that an indoor unit is requesting compressor to operate.  
Thermo-OFF: A condition that an indoor unit is not requesting compressor to operate.
- (NOTE 2) Even if stoppage is caused by "Alarm", "02" is not always indicated.
- (NOTE 3) If transmission between the inverter printed circuit board and the control printed circuit board is not performed during 30 seconds, the outdoor unit is stopped. In this case, stoppage is d1-05 cause and the alarm code "04" may be indicated.
- (NOTE 4) If transmission between the indoor unit and the outdoor unit is not performed during 3 minutes, indoor units are stopped. In this case, stoppage is d1-06 cause and the alarm code "03" may be indicated.
- (NOTE 5) In the system "20" will be indicated at the difference mode between indoor units.

- Countable up to 99.  
Over 99 times, "99" is always indicated.
- (NOTE 1) If a transmitting error continues for 3 minutes, one is added to the occurrence times.
- (NOTE 2) The memorized data can be canceled by the method indicated in "2.6 Self-Checking of PCB using Remote Control Switch"

to next page

Compressor Pressure/Frequency Indication

20 Discharge Pressure (High) (x 0.1 MPa) 41 18

21 Suction Pressure (Low) (x 0.01 MPa) 42 04

22 Control Information 43 44

This is an indication for internal information for the remote control switch. This does not have any specific meaning.

23 Operation Frequency (Hz) 44 44

This is an indication for frequency of Inverter.

Indoor Unit Capacity Indication

24 Indoor Unit Capacity 01 08

The capacity of the indoor unit is indicated as shown in the table below.

Capacity Code of Indoor Unit

Indication Code	Equivalent Capacity (HP)
06	0.8
08	1.0
10	1.3
13	1.5
14	1.8
16	2.0
18	2.3
20	2.5
22	2.8
26	3.0, 3.5
32	4.0
40	5.0
64	8.0
80	10.0

25 Outdoor Unit Code 02 Fn

"n" indicates total number of indoor units;

n = 1~9, A, B, C, D, E, F, U  
(10) (11) (12) (13) (14) (15) (16)

26 Refrigerant Cycle Number 03 01

27 Refrigerant Cycle Number 04 00

Expansion Opening Indication

28 Indoor Unit Expansion Valve Opening (%) 11 20

J3: 01 to 16

(01: when shipment (DSW5), Decimal Indication)

J4: 00 to 0F

(00: when shipment (DSW5), Indication with 16 numbers)

29 Outdoor Unit Expansion Valve MV1 Opening (%) 12 99

In case of models without Expansion Valve (MV2), the same figure is indicated.

30 Outdoor Unit Expansion Valve MV2 Opening (%) 13 99

31 Control Information 14 00

Estimated Electric Current Indication

32 Compressor Running Current (A) P1 25

The total current is indicated when several compressors are running.

In case of inverter compressor, the running current of primary side of inverter is indicated.

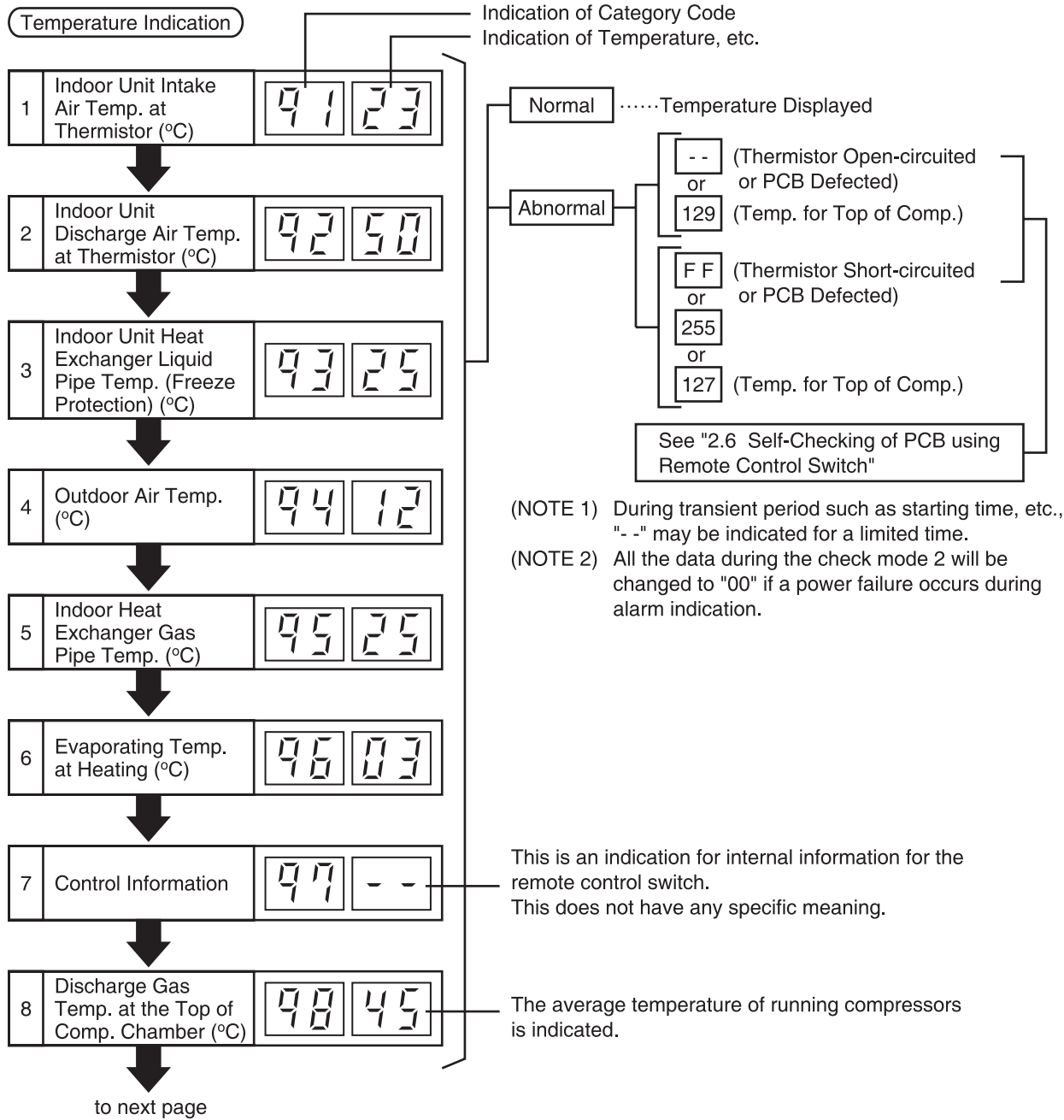
Returns to Temperature Indication

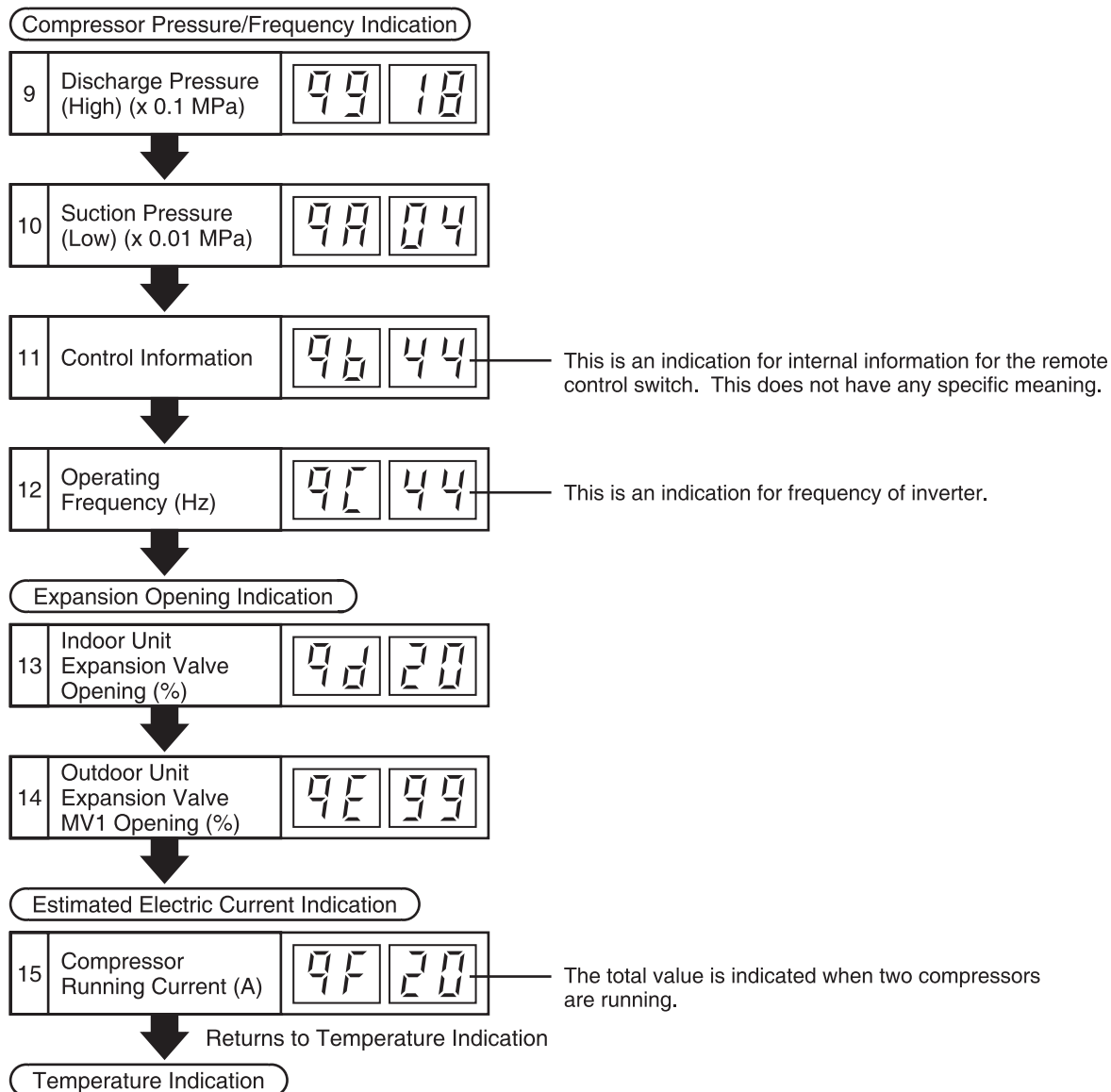
Temperature Indication

### 2.3.2 Contents of Check Mode 2

The latest data of the first three indoor units only connected serially are indicated when more than three indoor units are connected to one remote control switch.

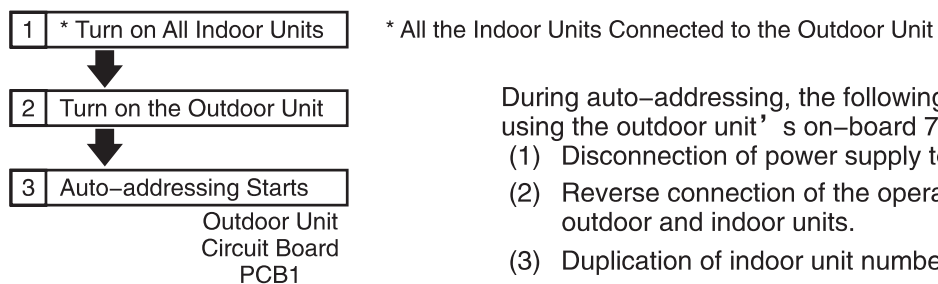
By pressing the  $\wedge$  part of "TEMP" switch, the next display is indicated. If the  $\vee$  part of "TEMP" switch is pressed, the previous display is indicated.





## 2.4 Troubleshooting by 7-Segment Display

### 2.4.1 Simple Checking by 7-Segment Display



During auto-addressing, the following items can be checked using the outdoor unit's on-board 7-segment LED display.

- (1) Disconnection of power supply to the indoor unit.
- (2) Reverse connection of the operating line between the outdoor and indoor units.
- (3) Duplication of indoor unit number.

### 2.4.2 Checking Method by 7-Segment Display

By using the 7-segment display and check switch (PSW) on the PCB1 in the outdoor unit, check each part of refrigerant cycle and operation. During the data check, do not touch other electrical parts except for the following switches to avoid electrical shock. The tools can not touch the electrical part. Otherwise, the electrical part may be damaged.

## 2.5 Protection Control Code on 7-Segment Display

- 1 ) Protection control code is displayed on 7-segment when a protection control is activated.
- 2 ) Protection control code is displayed while function is working, and goes out when released.
- 3 ) When several protection control are activated, code number with higher priority will be indicated (see below for the priority order)

(a) Priority order:

- a. Pressure ratio control
- b. High-pressure increase protection
- c. Inverter fin temperature increase protection
- e. Discharge gas temperature increase protection
- f. Low-pressure decrease protection
- g. Low-pressure increase protection
- h. Running current limit control
- i. High-pressure decrease protection

(b) For retry control, it indicates the latest retry operation. But the items (a) are given priority when starting.

Code	Protection Control	Code	Protection control
P01	Pressure ratio control ( ※ )	P11	Low pressure ratio retry
P02	High-pressure increase control	P12	Low-pressure increase retry
P03	Inverter current protection ( ※ )	P13	High-pressure increase retry
P04	Inverter fin temp. increase protection ( ※ )	P15	Vacuum, Td increase retry
P05	Td increase protection ( ※ )	P16	TdSH decrease retry
P06	Low-pressure decrease protection	P17	Inverter three-time retry
P09	High-pressure decrease protection	P18	Voltage decrease retry
P0A	Running current limit protection	P26	High-pressure decrease retry

Protection control is indicated only during the running of compressor.

Starting of protection control during back control indicates “ $\bar{L}$ ” instead of “ $\bar{L}$ ” . ( ※ parts )  
The protection control in back control is started faster than other conditions.

Retry indication continues for 30 minutes unless a protection control is indicated.

● Inverter Failure Code ( , 11 Check Items)

Code	Cause	Cause Code	Remark	
			Indication in Retry	Alarm Code
1	Transistor Module Stop (IPM Error) (Overload, Over Voltage, Increased Temp.)	17	P 17	53
2	Instant Overload	17	P 17	52
3	Inverter Fin Temp. Protection	17	P 17	54
4	Thermal Protection	17	P 17	52
5	Inverter Voltage Decrease	18	P 18	06
6	High Voltage	18	P 18	06
7	Abnormal Transmission	-	-	04
8	Current Sensor Failure	17	P 17	51
9	Instant Power Failure Check	18	-	-
11	Inverter Micro-computer Reset	18	-	53
12	Compressor Earth Wiring Check	17	P 17	04, 53
13	Phase Checking Abnormality	18	-	-
16	Inverter Failure	18	P 18	55

In order to adapt to conditions such as temperature change, the control of frequency and other items is performed to prevent the abnormal conditions by the protection control.

The activating conditions of protection control are shown in the table below.

Code	Protection Control	Activating Condition	Remarks
P01	Pressure Ratio Control	Compression Ratio $>9 \rightarrow$ Frequency Decrease (Pd+0.1)/(Ps+0.1) $\leq 2.2$ , $\rightarrow$ Frequency Increase	Ps: Suction Pressure of Compressor [MPa]
P02	High-pressure Protection	Pd $\geq 3.6$ MPa $\rightarrow$ Frequency Decrease	Pd: Discharge Pressure of Compressor [MPa]
P03	Current Protection	If current is over larger when frequency changes two times $\rightarrow$ Frequency Decrease	
P04	Inverter Fin Temperature Increase Protection	Inverter Fin Temperature $\geq 89^{\circ}\text{C} \rightarrow$ Frequency Decrease	
P05	Discharger Gas Temperature Increase Protection	Temperature at the top of compressor is high $\rightarrow$ Frequency Decrease (Maximum temperature is different depending on the frequency)	–
P06	Low-Pressure Decrease Protection	Low pressure is too low $\rightarrow$ Frequency Decrease (Minimum pressure is different depending on the environmental temperature)	–
P09	High-Pressure Decrease Protection	Discharge pressure of compressor is too low $\rightarrow$ Frequency Increase	–
P0A	Running Current Limit Control	Running Current for Compressor $\geq$ Setting value $\rightarrow$ Frequency Decrease	Setting Value: Set by external input; upper limit value of total running current of compressor is set 80%, 70% and 60% at normal operation.
P11	Pressure Ratio Decrease Retry	Compression Ratio (Pd+0.1)/(Ps+0.1) $<1.8$	When activating 3 times in 30 minutes. “43” alarm is indicated
P12	Low-Pressure Increase Retry	Ps $>1.5$ MPa	When activating 3 times in 30 minutes. “44” alarm is indicated
P13	High-Pressure Increase Retry	Ps $>3.8$ MPa	When activating 3 times in 30 minutes. “45” alarm is indicated
P15	Vacuum/Discharge Gas Temperature Increase Retry	In case of Ps $<0.09$ MPa over 12minutes. Discharge Gas Temperature $\geq 132^{\circ}\text{C}$ over 10 minutes or Discharge Gas Temperature $\geq 140^{\circ}\text{C}$ over 5 seconds	When activating 3 times in 1 hour, “47” (Ps) or “08” (Discharge Gas) alarm is indicated.
P16	Discharge Gas SUPER HEAT Decrease Retry	Discharge Gas Superheat Less than 10 degrees is maintained for 30 minutes.	When activating 3 times in 2 hours, “07” alarm is indicated.
P17	Inverter Trip Retry	Automatic Stoppage of Transistor Module. Activation of Electronic Thermal or Abnormal Current Sensor	When activating 3 or 6 times in 30 minutes, “48”, “51” or “53” alarm is indicated.
P18	Insufficient Voltage / Excessive Voltage Retry	Insufficient/Excessive Voltage at Inverter Circuit or CB Connector Part	When activating 3 times in 30 minutes, “06” alarm is indicated.
P26	High pressure decrease retry	Pd $<1.00$ MPa has been continued for one hour	Non alarm

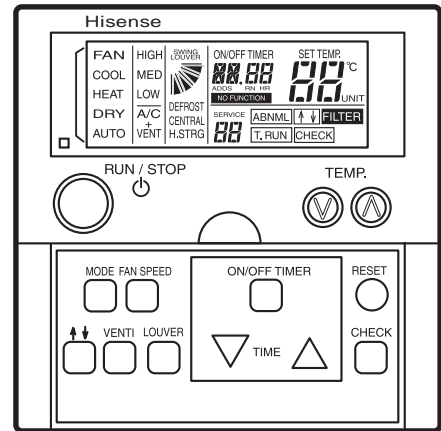
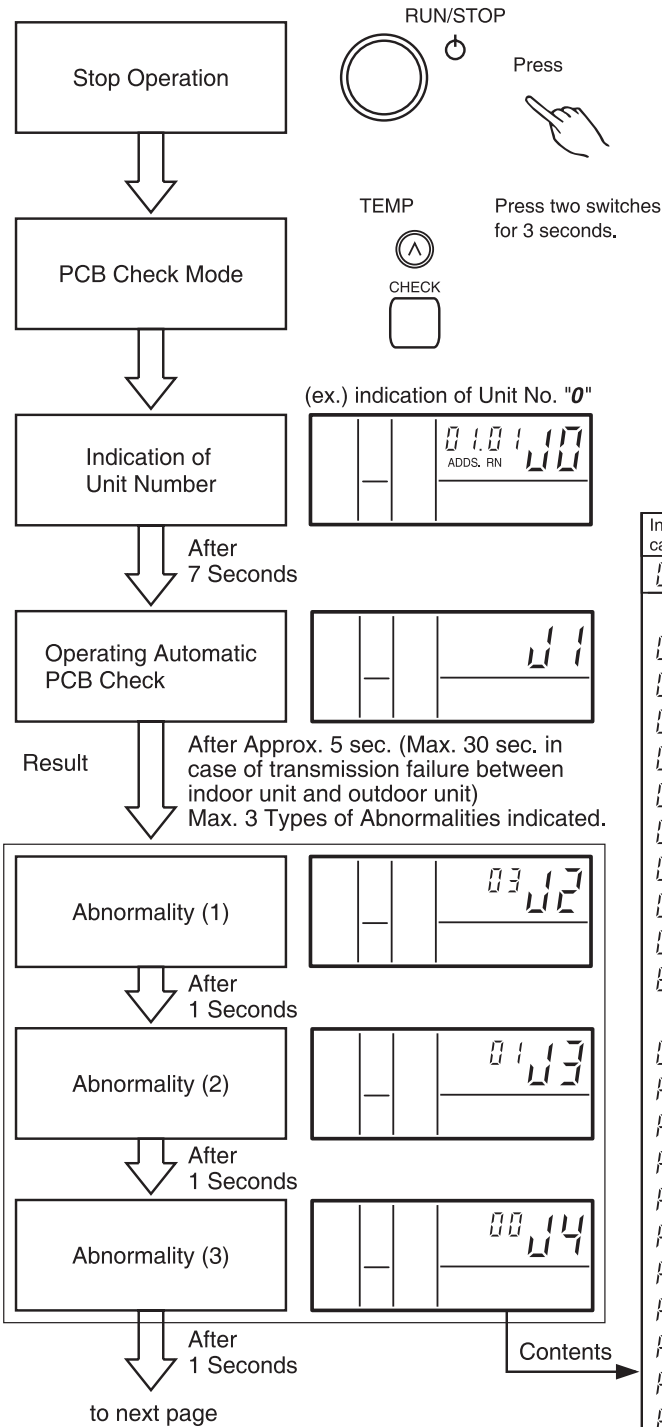
NOTES:

1. During protection control (except during alarm stoppage), the protection control code is indicated.
2. The protection control code is indicated during protection control and turns off when canceling the protection control.
3. After retry control, the condition of monitoring is continued for 30 minutes.



## 2.6 Self-checking of PCB Using Remote Control Switch

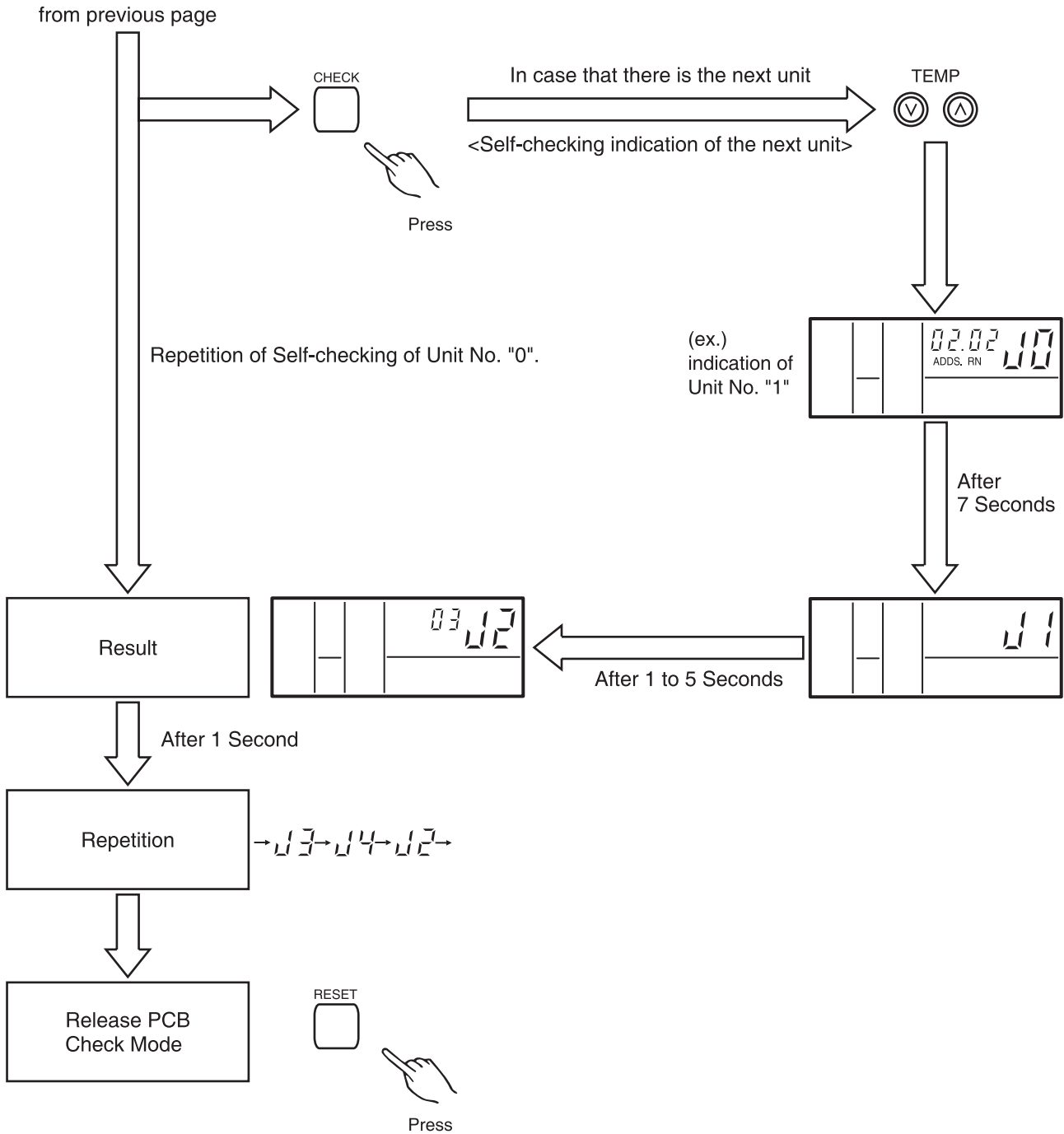
Following troubleshooting procedure is utilized for function test of PCB in the indoor unit and outdoor unit.



Indication	Contents
00	Normal
01	Abnormality (Open-circuit, Short-circuit, etc.) in circuit for Intake Air Temp. Thermistor
02	Discharge Air Temp. Thermistor
03	Liquid Pipe Temp. Thermistor
04	Remote Thermistor Abnormality
05	Gas Pipe Temp. Thermistor
06	Remote Sensor
08	Transmission of Central Station
0A	EEPROM
0b	Zero Cross Input Failure
EE	Transmission of Indoor Unit during This Checking Operation
07	Transmission of Outdoor Unit
F4	49FC Input Failure
F5	63H2 Input Failure
F6	Protection Signal Detection Circuit
F7	Phase Detection
F8	Transmission of Inverter
F9	High Pressure Sensor
Fb	Comp. Discharge Gas Temp. Thermistor
Fc	Low Pressure Sensor
Fd	Heat Exchanger Evaporation Temp. Thermistor
Ff	Ambient Air Temp. Thermistor

Indoor Unit PCB

Outdoor Unit PCB



**NOTE:**



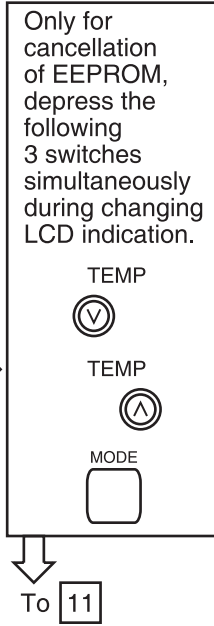
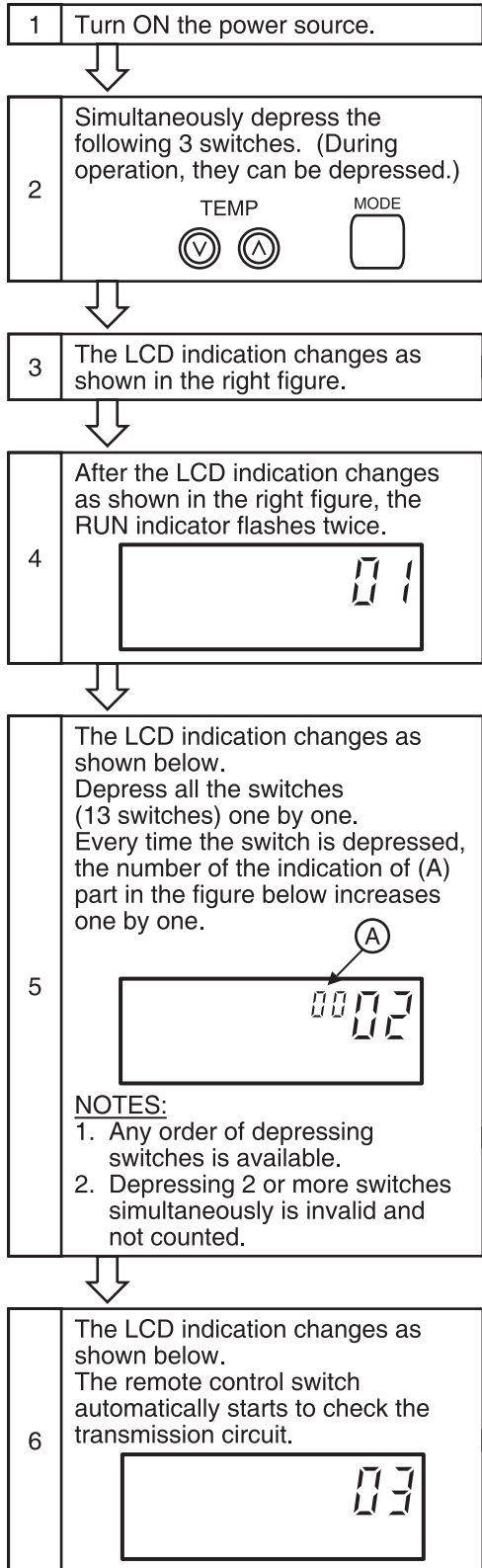
If this indication is continued and "J1" is not shown, this indicates that each one of indoor units is not connected to the remote control switch. Check the wiring between the remote control switch and indoor unit.

- (2) In this troubleshooting procedure, checking of the following part of the PCBs is not available.  
PCB in Indoor Unit: Relay Circuit, Dip Switch, Option Circuit.  
PCB in Outdoor Unit: Relay Circuit, Dip Switch, Option Circuit.
- (3) In the case that no result is produced in the troubleshooting procedure step (1), it may be transmission failure of central station (short circuit: TL-TG)
- (4) In the case that this troubleshooting is performed in the system using the central station, indication of the central station may change during this procedure. However, this is not abnormal.
- (5) After the troubleshooting procedure is finished, the record for occurrence times of abnormality will be erased.

## 2.7 Self-checking of Remote Control Switch

Cases where CHECK switch is utilized.

1. If the remote control switch readouts malfunction.
2. For regular maintenance check.



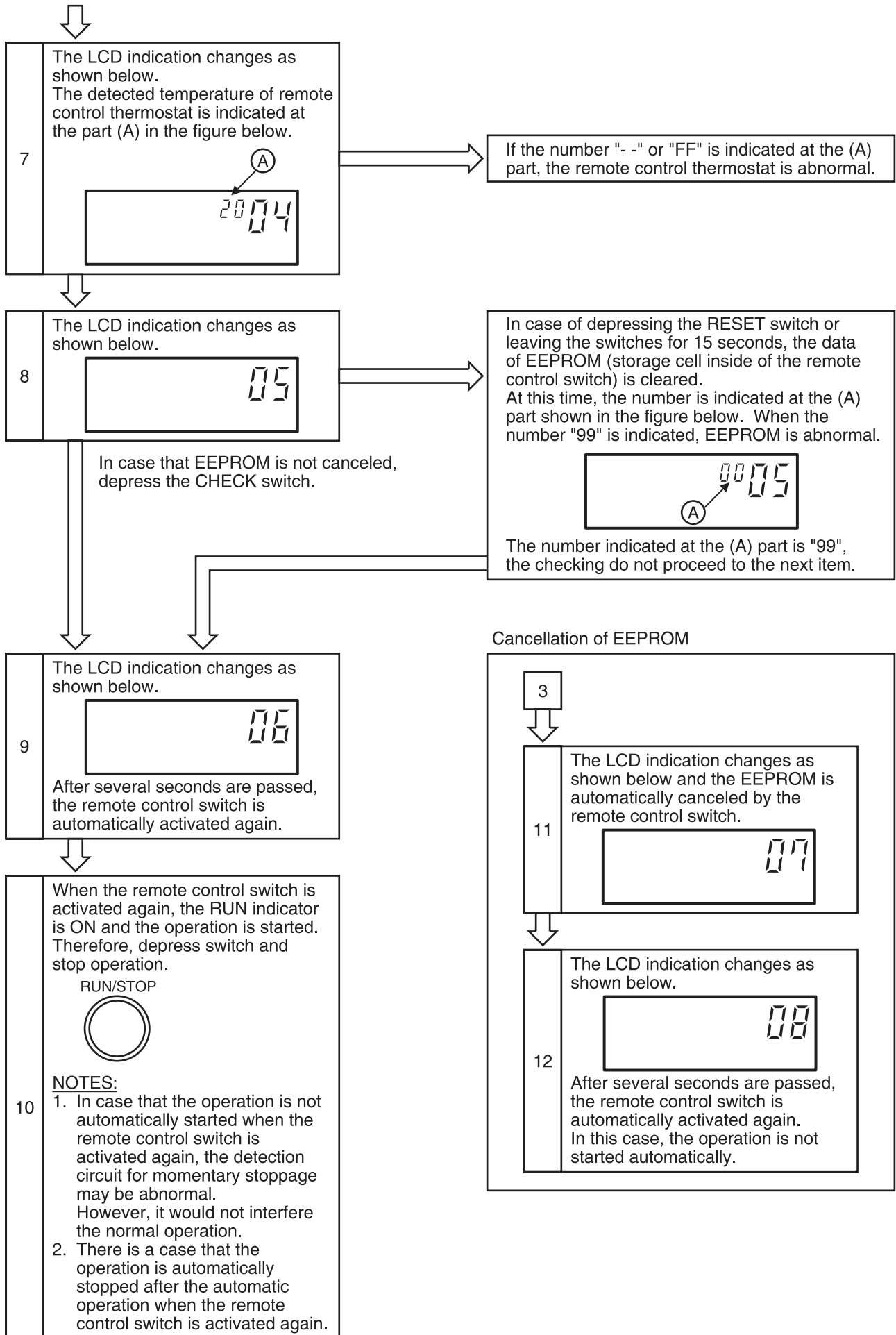
Changing of LCD Indication

No.	LCD Indication	Indicating Period (sec.)
1		For 1 second
2		For 1 second
3		For 1 second
4		For 1 second
5		For 3 seconds

Unless all the switches are depressed, the checking do not proceed to the next item.

In case that the transmission circuit is abnormal, the LCD indication remains as the left figure and the checking do not proceed to the next item.

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### 3. Caution on Refrigerant Leakage

#### 3.1 Maximum Permissible Concentration of HFC Gas

The refrigerant R410A, charged in the HI-FLEXI C Series, is an incombustible and non-toxic gas. However, if leakage occurs and gas fills a room, it may cause suffocation.

The maximum permissible concentration of R410A in air is  $\leq 0.3 \text{ kg/m}^3$ , according to the refrigeration and air conditioning facility standard (KHK S 0010) by the KHK (High Pressure Gas Protection Association) Japan.

Therefore, some effective measure must be taken to lower the R410A concentration in air below  $0.3 \text{ kg/m}^3$ , in case of leakage.

#### 3.2 Calculation of Refrigerant Concentration

1. Calculate the total quantity of refrigerant R (kg) charged in the system connecting all the indoor units of rooms to be air-conditioned.
2. Calculate the room Volume V ( $\text{m}^3$ ) of each room.
3. Calculate the refrigerant concentration C ( $\text{kg/m}^3$ ) of the room according to the following equation.

$$\frac{R: \text{Total Quantity of Charged Refrigerant (kg)}}{V: \text{Room Volume}} = C \text{ (Refrigerant concentration)} \leq 0.3(\text{kg/m}^3)$$

#### 3.3 Countermeasure for Refrigerant Leakage According to KHK Standard

The facility shall be arranged as follows referring to the KHK standards, so that the refrigerant concentration will be below  $0.3 \text{ kg/m}^3$ .

1. Provide a shutterless opening which will allow fresh air to circulate into the room.
2. Provide a doorless opening of 0.15% or more size to the floor area.
3. Provide a ventilator, linked with a gas leak detector, of  $0.4 \text{ m}^3/\text{min}$ . or more ventilating capacity of the air conditioning system utilizing refrigerant R410A.  
1 ton = Displacement of compressor  $\text{m}^3/\text{h}/5.7$   
AVW-76UE(7)(9)SR ..... 2.49 ton  
AVW-96UE(7)(9)SR ..... 3.32 ton  
AVW-114UE(7)(9)SR ..... 4.15 ton
4. Pay attention to the installation place, such as a basement, etc., where refrigerant may stay since it is heavier than air.

